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Environmental Assessment of NOx Control on a Compression Ignition Large Bore Reciprocating Internal Combustion Engine
Volume 2. Data Supplement

Acurex Corp., Mountain View, CA

Prepared for

Environmental Protection Agency
Research Triangle Park, NC

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January 1986

ENVIRONMENTAL ASSESSMENT OF NO_x CONTROL ON A COMPRESSION IGNITION LARGE BORE RECIPROCATING INTERNAL COMBUSTION ENGINE

Volume II
Data Supplement

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16. ABSTRACT Volume II of the report is a compendium of detailed emission and test data from field tests of a large-bore, compression-ignition reciprocating engine burning diesel fuel. The engine was tested during two operating modes: at baseline (normal operation), and with fuel injection retard for NOx emission reduction to levels below the proposed new source performance standard (NSPS) for such engines. The test data include preliminary equipment calibration, detailed engine operation, and complete exhaust gas emission measurement results. Exhaust gas emission measurements included (in addition to continuous monitoring for criteria gas pollutants) monitoring for volatile hydrocarbons (C1-C6), particulates, sulfur oxides, total organics in two boiling point ranges, organic compounds, semivolatile organic priority pollutants, trace elements, and biological assays of organic sample extracts.

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Diesel Engines	Compression Ignition	Stationary Sources	21G
Assessments		Environmental Assessment	14B
Nitrogen Oxides			07B
Field Tests		Combustion Modification	
Exhaust Gases		Fuel Injection	21B
		Timing Retard	

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SECTION 1

INTRODUCTION

The purpose of this Data Supplement is to document data in greater detail than was practical in the technical report for this field test (1). It is intended to provide sufficient detail for researchers to perform their own analysis of the data obtained. Readers are referred to the technical report for objectives, description of the source emission results, interpretation and conclusions. The data supplement contains the following information in corresponding sections:

2. PRELIMINARY EQUIPMENT CALIBRATION AND TESTS

   Calibration data for the dry gas meters used to sample exhaust gas for both EPA Method 5 and Source Assessment Sampling System (SASS) trains. Exhaust gas velocity traverse data across exhaust duct.

3. ENGINE OPERATING DATA

   Complete operating data of test engine including fuel and airflow, power output and inlet and exhaust temperatures. Data recorded by engine operators (employees of Colt Industries).

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[1] Castaldini, C. "Environmental Assessment of NO_x Control on a Compression Ignition Large Bore Reciprocating Internal Combustion Engine -- Volume I: Technical Results," EPA-600/7-86-001a, January 1986.

4. SAMPLING DATA SHEETS

Emission data obtained with continuous monitoring instrumentation. Operating data tables for EPA Method 5 (for particulate mass emissions), EPA Method 8 (for SO_2 and SO_3 sampling) and Source Assessment Sampling System (for particulate, trace element and organic sampling).

5. ANALYTICAL LABORATORY RESULTS

Ultimate analysis of lube oil and distillate oil used in the engine. Laboratory analysis reports on particulate emissions by gravimetric analysis; sulfur emissions by turbimetric analysis; trace element emissions by Spark Source Mass Spectrometry (SSMS) and Atomic Absorption Spectroscopy (AAS) analyses; total chromatographable organic (TCO) and gravimetry results (GRAV); infrared (IR) spectra of total sample extracts; determination of organic compounds by Gas Chromatography/Mass Spectrometry (GC/MS); liquid chromatography (LC) separation of selected sample extracts with TCO, GRAV, and IR analysis results for LC fractions; low resolution mass spectrometry (LRMS) analysis results for selected LC fractions and total sample extracts; and biological assay results of exhaust gas samples for both baseline and controlled NO_x tests.

SECTION 2

PRELIMINARY EQUIPMENT CALIBRATION AND TESTS

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PITOT TUBE CORRECTION FACTOR AND CALIBRATION DATA

Probe Description:

Pitot Tube Type: S TYPE

Identification No.: #4 07 A[illegible]

Calibration Date: 4/17/80

Calibrated By: [illegible] AYNSLEY

WIND TUNNEL SPECIFICATIONS

Type: Plexiglass (Round)

Inside Diameter: 12 inches

Length: 10 feet

Port Locations: 8 feet downstream

Cp std = .99 70°

"A" SIDE CALIBRATION

RUN NO.	Δp_{std} (IN. H_2O)	$\Delta p_{(s)}$ (IN. H_2O)	$Cp_{(s)}$	DEV.
1	0.16 0.17	0.22 0.24	0.8442 0.8332	
2	0.42 0.4[illegible]	0.51 0.56	0.8333 0.8471	
[illegible]	0.73 0.78	1.03 1.06	0.843 0.849[illegible]	
		AVERAGE	.842	

"B" SIDE CALIBRATION

RUN NO.	Δp_{std} (IN. H_2O)	$\Delta p_{(s)}$ (IN. H_2O)	$Cp_{(s)}$	DEV.
1	0.15 0.15	0.21 0.23	0.8[illegible]7 0.8257	
2	0.31 0.40	0.54 0.55	0.843 0.8[illegible]	
[illegible]	0.8[illegible] 0.80	1.01 1.09	0.8[illegible] 0.848	
		AVERAGE	.840	

"A" Side Average Deviation =

"B" Side Average Deviation = Must be ≤ 0.01

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The Almega Corporation

PITOT TUBE CORRECTION FACTOR AND CALIBRATION DATA

Probe Description: /

Pitot Tube Type: S TYPE

Identification No.: #3 11 'A' side numbered

Calibration Date: 4/17/80

Calibrated By: Eric ANNSLEY

WIND TUNNEL SPECIFICATIONS

Type: Plexiglass (Round)

Inside Diameter: 12 inches

Length: 10 feet

Port Locations: 8 feet downstream

Cp std = .99 70°

		"A" SIDE CALIBRATION		
RUN NO.	ΔPstd (IN. H_2O)	Δp (s) (IN. H_2O)	Cp(s)	DEV.
1	0.11 0.11	0.15 0.16	0.8477 0.8209	
2	0.39 0.39	0.54 0.55	0.8413 0.8337	
3	0.79 0.78	1.11 1.06	0.8352 0.8492	
		AVERAGE	0.838	

		"B" SIDE CALIBRATION		
RUN NO.	ΔPstd (IN. H_2O)	Δp (s) (IN. H_2O)	Cp(s)	DEV.
1	0.12 0.11	0.17 0.15	0.8317 0.8477	
2	0.39 0.41	0.55 0.57	0.8337 0.8396	
3	0.81 0.79	1.10 1.10	0.8495 0.8390	
		AVERAGE	0.840	

"A" Side Average Deviation =

"B" Side Average Deviation = Must be ≤ 0.01

THE ALMEGA CORPORATION

PITOT TUBE CORRECTION FACTOR AND CALIBRATION DATA

Probe Description:

Pitot Tube Type: S TYPE

Identification No.: #1 #50 [illegible]

Calibration Date: 4/17/80

Calibrated By: ERIC AYNSLEY

WIND TUNNEL SPECIFICATIONS

Type: Plexiglass (Round)

Inside Diameter: 12 inches

Length: 10 feet

Port Locations: 8 feet downstream

Cp std = .99 @ 70°

"A" SIDE CALIBRATION

RUN NO.	ΔP_{std} (IN. H_2O)	$\Delta p_{(s)}$ (IN. H_2O)	$Cp_{(s)}$	DEV.
1	0.08 0.08	0.11 0.11	0.8443 0.8443	
2	0.41 0.42	0.57 0.58	0.8376 0.8425	
3	0.79 0.78	1.11 1.08	0.8352 0.8413	
		AVERAGE	.841	

"B" SIDE CALIBRATION

RUN NO.	ΔP_{std} (IN. H_2O)	$\Delta p_{(s)}$ (IN. H_2O)	$Cp_{(s)}$	DEV.
1	0.08 0.11	0.11 0.15	0.8443 0.8447	
2	0.40 0.40	0.56 0.55	0.8367 0.8443	
3	0.78 0.80	1.10 1.10	0.8337 0.8443	
		AVERAGE	.841	

"A" Side Average Deviation =

"B" Side Average Deviation = Must be ≤ 0.01

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PITOT TUBE CORRECTION FACTOR AND CALIBRATION DATA

Probe Description: -

Pitot Tube Type: TYPE

Identification No.: #2 #10 A side

Calibration Date: 4/11/80

Calibrated By: ERIC AYNSLEY

WIND TUNNEL SPECIFICATIONS

Type: Plexiglass (Round)

Inside Diameter: 12 inches

Length: 10 feet

Port Locations: 8 feet downstream

Cp std = .99 70°

"A" SIDE CALIBRATION

RUN NO.	Δp_{std} (IN. H_2O)	$\Delta p_{(s)}$ (IN. H_2O)	$Cp_{(s)}$	DEV.
1	0.16 0.17	0.22 0.23	0.8442 0.8511	
2	0.39 0.42	0.54 0.56	0.8413 0.8567	
3	0.81 0.79	1.10 1.09	0.8495 0.8428.	
		AVERAGE	.8447	

"B" SIDE CALIBRATION

RUN NO.	Δp_{std} (IN. H_2O)	$\Delta p_{(s)}$ (IN. H_2O)	$Cp_{(s)}$	DEV.
1	0.15 0.15	0.21 0.21	0.8367 0.8367	
2	0.42 0.41	0.58 0.58	0.8425 0.8324	
3	0.81 0.80	1.11 1.10	0.8457 0.8443	
		AVERAGE	.837	

"A" Side Average Deviation =

"B" Side Average Deviation = Must be ≤ 0.01

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Date 8-77 [illegible]

Barometric [illegible] 29.21

[illegible] 77

METER CALIBRATION DATA

[illegible]	[illegible]	[illegible]	[illegible]	Gas Vol. Primary Meter	Gas Vol. Dry Test Meter	Temperature						Time	[illegible]	[illegible]
						Primary Meter			Dry Test Meter					
						Inlet	Outlet	Avg	Inlet	Outlet	Avg			
.80	=.8			444.890 434.975	269.758 259.758	78 78	78 79	78.25	77 79	78 78	78	19.4	1.004	1.380
				9.912	10.000									
1.80	=1.8			454.860 444.890	279.758 269.758	76 76	77 78	76.75	75 76	76 76	75.75	13.5	1.004	1.429
				9.970	10.000									
2.82	=2.8			464.860 454.860	289.758 279.758	76 77	77 78	77.75	78 81	76 79	78	10.9	1.005	1.437
				10.000	10.000									
3.85	=3.8			[illegible] 467.10	301.000 291.000	78 79	79 80	79.25	81 83	79 79	80.5	9.4	1.004	1.444
				10.026	10.000									

γ avg = 1.005

K₀ avg = 1.4[illegible]

Average

Date [illegible]
Time [illegible]
Barometric Pressure [illegible]
Avg. [illegible] Temperature [illegible]

Orifice Meter
Orifice Manometer 8117 WW3B
Primary Calibration Meter 26^453
Control Module 526-088

Operator JARMAN
Wet Bulb Temperature

METER CALIBRATION DATA

Orifice plate # 0[illegible]

Orifice Manometer ΔH (in. H₂O)	Orifice Manometer ΔH (in. H₂O)	Primary Meter ΔP (in. H₂O)	Dry Test Meter P (in. H₂O)	Gas Volume Primary Meter V_p (ft³)	Gas Volume Dry Test Meter V_d (ft³)	Temperature: Primary Meter Inlet, T_pi (°F)	Primary Meter Outlet, T_po (°F)	Primary Meter Avg., T_p (°F)	Dry Test Meter Inlet, T_di (°F)	Dry Test Meter Outlet, T_do (°F)	Dry Test Meter Avg., T_d (°F)	Time θ (min)	γ	ΔH@	[illegible]
.69	[illegible]			935.151 920.700	143.845 129.785	66 66	64 65	65.25	65 64	64 63	63.5	34.0	1.001	.710	
	[illegible]			14.451	14.06										
1.6	[illegible]			950.084 935.151	158.[illegible] 143.845	[illegible] 65	65 65	65.25	64 65	64 64	64.75	2[illegible]	[illegible]	[illegible]	
	[illegible]			14.933	14.40										
2.6	[illegible]			[illegible] [illegible]	[illegible] 158.[illegible]	64 72	65 67	6[illegible].25	[illegible]	[illegible]	[illegible].75	17.0	[illegible]	.71[illegible]	
	[illegible]			15.081	1[illegible].777										
3.6	[illegible]			[illegible]	[illegible]	[illegible]	67 65	70.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	[illegible]			[illegible]	[illegible]										
.69	[illegible]			[illegible] 198 [illegible]	[illegible]	[illegible]	69 [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.79	3
	[illegible]			15.051	14.068										
1.6	[illegible]			[illegible] [illegible]	[illegible] 203.0[illegible]	[illegible]	[illegible]	[illegible]	66 66	66 66	[illegible]	9.0	[illegible]	1.77	3
	[illegible]			15.366	15.144										
[illegible]	[illegible]			[illegible] [illegible]	[illegible] 218.[illegible]	[illegible] 83	69 [illegible]	74.0	67 67	[illegible]	[illegible]	7.0	[illegible]	1.75	6
	[illegible]			15.355	15.068										
3.6	[illegible]			[illegible]932 26.969	[illegible] [illegible]	78 [illegible]	70 72	[illegible].0	67 68	67 67	67.25	7.0	[illegible]	1.74	1
	[illegible]			17.923	1[illegible]										
.69	[illegible]			[illegible] [illegible]	[illegible]	[illegible] 81	71 72	74.75	[illegible]	67 [illegible]	[illegible]	7.0	[illegible]	3.7	81
	[illegible]			15.965	15.[illegible]										
1.6	[illegible]			[illegible] [illegible]	[illegible] 266.478	[illegible]	73 74	79.0	69 70	68 66	68.25	4.0	[illegible]	[illegible]	[illegible]
	[illegible]			14.177	14.037										
[illegible]	[illegible]			[illegible] 74.914	[illegible] 280.515	[illegible] 92	74 77	82.75	[illegible] 71	68 [illegible]	69.25	4.0	[illegible]	3.5	43
	[illegible]			17.745	17.744										
3.6	[illegible]			[illegible].791 92.659	313.537 298.237	[illegible] [illegible]	77 78	[illegible].75	71 71	68 69	69.75	3.0	[illegible]	[illegible]	21
	[illegible]			15.132	15.298										
	[illegible]														

Average	

K₀ = .714

= 1.02[illegible]

K = 1.75[illegible]

α = 1.03[illegible]

α = 1.166

K₀ = 3.585

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Date 5/?/?0
Time 11:00
Barometric Pressure 29.75
Ambient Temperature 72°F

Orifice Meter
Orifice Magnehelic 4E72-50321
Primary Calibration Meter 259453
Control Module [illegible]16

Operators Holden, [illegible], Micel
Wet Bulb Temperature

Orifice Plate # 0009

METER CALIBRATION DATA

Orifice Manometer ΔH_m (in. wg)	Orifice Magnehelic ΔH_D (in. wg)	Primary Meter ΔH_p (in. wg)	Dry Test Meter P_{dg} (in. wg)	Gas Volume Primary Meter V_p (ft³)	Gas Volume Dry Test Meter V_d (ft³)	Temperature: Primary Meter Inlet T_{pi} (°F)	Primary Meter Outlet T_{po} (°F)	Primary Meter Avg. T_{pa} (°F)	Dry Test Meter Inlet T_{di} (°F)	Dry Test Meter Outlet T_{do} (°F)	Dry Test Meter Avg. T_{da} (°F)	Time t (min.)	γ	K_D
	0.6 0.4			9[illegible].157 955.594 12.513	[illegible].451 814.100 12.351	83 84	84 83	83.5	79 [illegible]	79 79	79	28	.997	[illegible]
	.6 0.8			[illegible] 769.157 10.435	[illegible] [illegible] 10.172	[illegible] 87	[illegible]	84.5	77 80	79 79	79	15	.991	.696
	2.6 1.2			973.351 975.342 14.751	951.313 [illegible].643 14.450	87 89	[illegible]	86	[illegible]	79 80	80	17	[illegible]	.680
	3.6 1.6			[illegible].435 1193.3[illegible] 13.517	863.[illegible] 851.[illegible] 12.515	[illegible]	85 84	85	[illegible] 82	[illegible]	80	13	.996	.671
	.6 2.0			121 771 1001.420 23.37	378.93[illegible] [illegible].928 15.344	[illegible]	85 84	86	80 79	80 [illegible]	79.5	13	.997	.937
	.6 2.4			1057.5[illegible] 1081.7[illegible] 15.744	394.35[illegible] [illegible] [illegible].430	[illegible]	[illegible]	85	80 82	80 82	80	9	.999	1.748
	2.6 2.8			1055.312 1037.515 17.797	911.777 894.382 17.395	73 102	87 [illegible]	93	80 82	80 80	80	8	1.0[illegible]	.704
	3.6 3.2			1065.658 1055.312 10.346	921.884 911.777 10.107	101 105	88 90	96	80 81	[illegible]	80	4	1.05	.223
	3.6													
2	1.6 3.8			[illegible].474 10[illegible] .737	[illegible] [illegible] [illegible]	[illegible] 10[illegible]	90 91	96	81 81	81 81	81	3	[illegible]	[illegible]
3	[illegible] 4.2			1133.[illegible] 1[illegible].714 14.344	738.[illegible] 449.7[illegible] 1[illegible].125	102 105	92 93	99	81 82	81 81	81	3.5	[illegible]	[illegible]
1	.6 4.6			1077.097 1065.658 11.579	933.185 921.881 11.304	94 102	89 90	95	81 81	80 80	80.5	5	[illegible]	[illegible]
4	5.6 5.0			11[illegible] 1123.318 [illegible]308	9[illegible] 758.8[illegible] 10.213	109 114	89 96	102	80 82	80 81	80	2	[illegible]	[illegible]
													Average	

6

31

8

α .995
K_0 .694

α 1.003
K_0 1.786

α 1.020
K_0 3.579

Date 4/7-[illegible]
Time 1100
Barometric Pressure 29.80
Ambient Temperature 65°F

Orifice Meter [illegible] 1224
Orifice Magnehelic [illegible] H63
Primary Calibration Meter [illegible] 1145 S
Control Module 0038

Operators [illegible]
Wet Bulb Temperature

orifice plate # 0038

METER CALIBRATION DATA

Orifice Manometer ΔH_{mpf} (in. wg.)	Orifice Magnehelic ΔH_g (in. wg.)	Primary Meter ΔH_p (in. wg.)	Dry Test Meter P_{dg} (in. wg.)	Gas Volume Primary Meter V_p (ft.³)	Gas Volume Dry Test Meter V_d (ft.³)	Temperature: Primary Meter Inlet, T_{pi} (°F)	Primary Meter Outlet, T_{po} (°F)	Primary Meter Avg., T_{pm} (°F)	Dry Test Meter Inlet, T_{di} (°F)	Dry Test Meter Outlet, T_{do} (°F)	Dry Test Meter Avg., T_{dm} (°F)	Time t (min.)	[illegible]	K_0
	6			492.196 482.[illegible]	556.948 547.043	67 68	66 67	67	67 67	65 67	67	[illegible]	.997	.754
	0.4			9.998	9.905									
	16			[illegible] 492.[illegible]	[illegible] 556.948	[illegible]	67 68	69	68 68	67 67	68	15	.998	.759
	0.8			10.787	10.653									
	26			516.[illegible] 502.[illegible]	581.071 567.[illegible]	73 76	68 69	72	68 69	68 68	69	15	1.009	.732
	1.2			13.628	13.464									
	36			[illegible] [illegible].613	546.[illegible] [illegible]	77 [illegible]	70 73	75	69 70	68 69	69	15	1.007	.728
	1.6			15.950	15.735									
	6			551.[illegible] [illegible]	615.779 596.807	70 75	70 70	71	70 70	70 70	70	[illegible]	.993	1.85
	2.0			19.168	18.972									
	16			[illegible]	[illegible]	[illegible]	[illegible]	82	70 71	70 71	71	18	[illegible]	1.869
	2.4			33.731	33.419									
	26			[illegible]	[illegible].188	88 95	76 78	84	72 73	71 71	72	10	.994	1.86
	2.8			23.652	23.256									
	36			[illegible]	[illegible]	[illegible]	[illegible]	76	70 71	70 71	71	[illegible]	1.003	1.86
	3.2			19.019	18.920									
	6			[illegible]	647.315 [illegible]	80 88	77 76	80	71 72	71 71	71	11	1.005	3.71
	3.6			26.539	26.301									
	26			[illegible]	[illegible]	[illegible]	76 80	84	72 74	71 72	72	7	1.027	3.7
	4.0			25.920	25.671									
	16			703.637 680.592	766.180 743.286	94 100	80 83	89	74 76	72 72	74	5	1.0[illegible]	3.6
	4.4			23.045	22.894									
	36			730.086 703.637	792.556 766.180	97 103	83 86	92	76 78	72 73	75	5	1.044	3.7
	4.8			26.449	26.476									
	5.0													

Average	

α = 0.799
K_0 = 0.741

α = 1.005
K_0 = 1.860

α 1.024
K_0 = 3.719

Reproduced from best available copy.

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Colt - Beloit, Ws.
DATE 4-21-80
SAMPLING LOCATION Diesel Stack
INSIDE OF FAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE A) See Schematic
INSIDE OF NEAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE B) " "
STACK I.D., (DISTANCE A - DISTANCE B) 15.375 avg.
NEAREST UPSTREAM DISTURBANCE 2.34 diam.
NEAREST DOWNSTREAM DISTURBANCE 3.90 diam.
CALCULATOR DaRos

SAME AS 4-21-80
DATA
(DIESEL ENGINE STACK)

SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	INCH. STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1		15.375	~~.22~~ 1.0		
2			~~.68~~ 1.0		
3			1.15		
4			1.68		
5			2.24		
6			2.90		
7			3.63		
8			4.60		
9			5.87		
10			9.50		
11			10.82		
12			11.75		
13			12.45		
14			13.13		
15			13.70		
16			14.20		
17			~~14.70~~ 14.375		
18		15.375	~~15.10~~ 14.375		

EPA (Dur) 232
4.72

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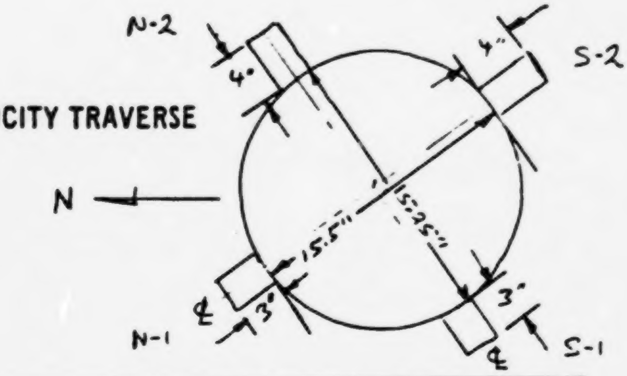
PRELIMINARY VELOCITY TRAVERSE

PLANT Colt - Beloit, Ws
DATE 4-21-80
LOCATION Diesel - Stack - Baseline
STACK I.D. 15.375" average
BAROMETRIC PRESSURE, in. Hg 29.18
STACK GAUGE PRESSURE, in. H_2O + 3.0 (29.40)
OPERATORS DaRos, Kabemann



SCHEMATIC OF TRAVERSE POINT LAYOUT

ROOF

Port S-1

START 1515 STOP: 1525

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	2.8	~~515~~ 600
2	2.8	~~515~~ 600
3	4.0	605
4	4.4	605
5	5.2	615
6	5.2	615
7	5.5	620
8	6.3	625
9	6.9	630
10	6.8	630
11	7.4	630
12	7.2	630
13	7.2	625
14	7.2	620
15	6.6	620
16	6.8	620
17	6.5	620
18	6.5	620
	105.3	
$\Sigma\sqrt{43.14}$		
avg $\sqrt{\Delta P}$		
2.397		
AVERAGE	5.85	618

Port N-1

START: 1535 STOP: 1540

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	4.5	600
	4.5	600
	5.0	615
	5.5	615
	5.7	620
	6.5	620
	7.0	615
	6.3	615
	7.1	625
	7.1	625
	6.8	625
	6.3	625
	6.3	625
	6.0	625
	5.7	620
	5.6	620
	5.7	620
18	5.7	620
	107.3	
$\Sigma\sqrt{43.852}$		
avg $\sqrt{\Delta P}$		
2.44		
AVERAGE	5.96	618

Pitot Tube I.D. = No 10. Ambient Temp. = 75°F
Cp = Side A .84 Side B .84

PRELIMINARY VELOCITY TRAVERSE

PLANT Colt -- Beloit, WS
DATE 4-23-80
LOCATION Diesel - Stack Controlled
STACK I.D. 15.375" avg
BAROMETRIC PRESSURE. in. Hg 29.18 @ 0900
STACK GAUGE PRESSURE in. H_2O + 8.2 [29.42]
OPERATORS Kaufmann, Render

SAME AS
4-21-80 DATA
(DEISEL ENGINE STACK)

SCHEMATIC OF TRAVERSE POINT LAYOUT

START: 0945 STOP: 1010

PORT S-1

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
	5.3	580
	4.8	580
	5.5	595
	6.2	600
	6.7	600
	6.8	600
	6.7	600
	8.3	610
	8.5	610
	8.1	610
	7.6	605
	8.6	605
	7.5	605
	7.5	605
	6.8	605
	7.7	605
	7.4	605
	7.0	605
AVERAGE	7.05	601.4

PORT N-1

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
	5.1	590
	5.3	590
	5.1	585
	5.2	590
	6.0	600
	6.2	600
	6.3	600
	7.2	605
	7.4	605
	8.0	608
	8.3	608
	8.4	603
	7.6	605
	7.7	600
	7.5	603
	6.7	600
	7.0	600
	7.1	600
AVERAGE	6.78	599.5

6.92 600.

EPA (Dur) 233
4 72

SECTION 3

ENGINE OPERATING DATA

Complete engine operating data were recorded during the duration of both the baseline and low-NO_x tests. These field data appear in the following data sheets. The Method 8 baseline test for sulfate emissions was not done concurrent to the Method 5 particulate, hydrocarbon, and SASS tests because of sampling equipment malfunctions. That is why a separate set of engine data logs are provided for the baseline Method 8 test and not for the low-NO_x test. Engine operating data during both runs at baseline condition were different slightly in load and combustion air flow. Changes in combustion air flow were caused by changes in inlet engine air temperature which varied from an average of 305 K (89°F) during the first baseline test to 281 K (46°F) during the second baseline test or Method 8 test. The cooler temperature of inlet combustion air resulted in an 8-percent increase in combustion air flow.

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BF-4173C

Ignition or Injection Timing ~~384 CS~~	35.8°
Comp. Ratio ~~35 OCS~~	36.15°
Gas Cam Timing 137° BTDC @ ~~...LIFT~~	
Crankled 18°C	
K. W. Mtr. Constant 1200	
Mobil Gard 446	
#2 Shop	

TEST LOG
EXPERIMENTAL DEPT.

LOG NO. 4534
DATE: 4-22-80

POWER PARTS
C. RING
LINERS
PISTONS
SPECIAL

TEST: Emissions Baseline Diesel
ENGINE E.L. 8¼ x 10 TURBO ENGINE NO. 87247

	ENGINE POWER OUTPUT										MISCELLANEOUS				ENGINE AIR				ENGINE H. O.			ENGINE LU			
															Press. In HG	Press. In H.O.	Temp. °F	Temp. °F	PSIG	Temp. °F		Press.-PSIG			
Line No.	Time & Shift	Hour Meter Add 82400	RPM 900	Sec. for 20 Turns (KW)	KW Meter % Reg.	Alt. KW Output	Alt. Eff. %	BHP	% Load	#1 Pump Rack C.S./O.C.S.	Room Temp.	Corrected Barometer	C.C. Vacuum	Gov. Load Limit	Air Receiver	Blower Suction	Air Inlet	Air Receiver	Pump Disch.	To Engine	From Engine	Pump Disch.	To Strainer	To Engine	Upper Header
1	@ 0720 HRS. START - WARMING - @ 0735 HRS. ON-LINE 100% DIESEL MODE. ADVANCED TIMING TO GET 1350																								
2	0815	82.7	900	57.4	99.8	1508	96.0	2105	100.25	[illegible]	97	29.04	116	R.S.	22.21	19.9		147	44	156	160	60	45	44	36
3	@ 0845 HRS. REMOVED LOAD - ENGINE STOPPED ENG. TO CHECK INJ. TIMING. C.S = 35.8 OCS = 36.15 Cu																								
4	UP PU. PS - 0937 - 22 403.1 START - @ 0945 - ON-LINE 100% DIESEL.																	149	44	157	161	59	43	42	35
5	1154	85.4	900	57.83	99.8	1497	96.0	2090	99.5	9.5/9.6	106	28.92	1.5	R.S.	21.44	19.1		149	44	157	161	59	43	42	34.8
6	1330	87.0	900	57.38	99.8	1509	96.0	2106	100.28	9.1/9.6	107	28.87	1.5	R.S.	22.11	19.8		151	44	157	161	59	43	42	34.8
7	1400	87.5	900	59.75	99.8	1499	96.0	2092	99.64	9.4/9.6	109	28.86	1.5	R.S.	21.64	19.26		119	44	157	161	59	43	42	34.8
8	1430	88.0	900	57.95	99.8	1494	96.0	2085	99.3	9.4/9.6	107	28.81	1.4	R.S.	21.44	19.09		149	44	157	161	59	43	42	34.9
9	1500	88.5	900	57.73	99.8	1499	96.0	2094	99.69	9.4/9.6	106	28.84	1.5	RS	21.43	19.1		149	44	157	161	59	43	42	34.9
10	1530	89.0	900	57.88	99.8	1496	96.0	2088	99.42	9.6/9.8	108	28.83	1.5	RS	21.5	19.15		149	44	157	161	59	43	42	34.9
11	1555	89.4	900	57.9	99.8	1475	96.0	2059	99.38	9.6/9.8	110	28.82	1.5	RS	21.48	19.13		149	44	157	161	59	43	42	34.9
12	1625	89.9	900	57.89	99.8	1475	96.0	2087	99.4	9.6/9.9	112	28.81	1.4	RS	21.47	19.08		149	44	157	161	59	43	41.9	34.9
13	1655	90.4	900	57.91	99.8	1495	96.0	2087	99.37	9.6/9.9	113	28.80	1.3	RS	21.44	19.05		149	44	157	161	59	43	41.9	34.9
14	1725	90.9	900	57.98	99.8	1493	96.0	2084	99.24	9.6/9.9	110	28.80	1.5	RS	21.45	19.09		148	44	157	161	59	43	41.9	34.9
15	1755	91.4	900	57.94	99.8	1494	96.0	2086	99.3	9.6/9.9	109	28.80	1.4	RS	21.55	19.15		148	44	157	161	59	43	41.9	34.9
16	1825	91.9	900	58.0	99.8	1493	96.0	2083	99.2	9.6/9.9	106	28.81	1.4	RS	21.66	19.36		148	44	157	161	59	43	42	34.9
17	1855	92.4	900	57.04	99.8	1518	96.0	2111	100.88	9.9/10.0	106	28.82	1.3	RS	22.18	19.8		148	44	157	161	59	43	42	34.9
18	1925	92.9	900	56.99	99.5	1519	96.0	2130	100.97	9.7/10.0	104	28.82	1.3	RS	22.25	19.93		149	44	157	161	59	43	41.9	34.9
19	1955	93.4	900	56.83	99.8	1523	96.0	2126	101.3	9.9/10.0	102	28.83	1.3	RS	22.45	20.16		149	44	157	161	59	43	42	34.9
20	2020	93.8	900	56.92	99.8	1531	96.0	2133	101.09	9.9/10.0	102	28.84	1.3	RS	22.55	20.25									
21																									
22																									
23																									
24																									
25																									
26																									
27																									
28																									
29																									
30																									

19368 MAX.

OIL			FUEL OIL						NATURAL GAS FUEL															
Temp. °F			PSIG						Press. "HG		Temp.								Press.-PSIG					
To Engine	From Engine	Level in C.C.	Fuel Header	Sec. For Lbs. of Fuel	Fuel Cons Lbs./Hr.	Fuel Rate Lbs./BHP-Hr.	Corrected 19350 LB/BHP/HR	Fuel Rate BTU/BHP-Hr.	Meter Inlet	Meter Inlet ABS	Meter Inlet °F	Meter Inlet ABS °B	Sec. for Ft.³ Gas	Ft.³/Hr. @ Std. Temp. & Press.	Gas Heat Value BTU/Ft.³	Gas Consumption BTU/Hr. x 10³	Specific Gas Fuel Rate BTU/BHP-Hr.	Total Specific Fuel Rate BTU/BHP-Hr.	Supply To Engine	Cell Hdr.	Engine Hdr.			Line No.
																								1
165	185	-51	16.6	233.2	771.8	.3666	.3670																	2
																								3
																								4
168	187	-50	16.4	232.73	772.9	.3700	.3704																	5
168	138	-48	16.4	231.56	777.3	.3691	.3694																	6
168	149	-48	16.3	232.37	774.6	.3702	.3706																	7
168	188	.50	16.0	232.39	774.6	.3715	.3718																	8
168	188	-52	16.3	232.46	774.2	.3698	.3701																	9
168	188	-53	16.3	232.57	774.0	.3707	.371																	10
168	188	-51	16.3	233.18	771.9	.3699	.3702																	11
168	188	-50	16.5	233.3	771.5	.3697	.370																	12
168	188	.50	16.5	233.35	771.4	.3696	.3699																	13
168	185	-54	16.4	232.56	773	.3709	.3713																	14
168	188	-55	16.0	233.25	771.7	.3699	.3703																	15
168	148	-56	16.5	232.32	774.8	.3719	.3723																	16
168	188	-56	16.3	231.24	778.4	.3673	.3677																	17
168	188	-57	16.4	230.35	780.6	.3682	.3686																	18
148	188	-58	16.4	230.65	780.3	.3670	.3674																	19
168	188	-59	16.4	[illegible]	771.9	.3674	.3677																	20
																								21
																								22
																								23
																								24
																								25
																								26
																								27
																								28
																								29
																								30
																								31
																								32
																								33

33
34

Line No.	TURBO RPM C.S.	TURBO RPM O.C.S.	COMPRESSOR AIR Pressure To Comp Inlet H2O C.S.	To Comp Inlet O.C.S.	From Comp. In PSI C.S. PSI	From Comp. In O.C.S.	Temp. °F Inlet	Temp. °F From Comp. C.S.	From Comp. O.C.S.	BLOWER Disch PSI	Suct °F	Disch °F	WATER Temps. °F From Turbo. C.S.	From Turbo. O.C.S.	Air Cooler In	Air Cooler Out	LUBE OIL PSIG Turbo. Inlet	Temp. °F From Turbo. C.S.	From Turbo. O.C.S.	TURBINE EXHAUST Press. "HG To C.S.	Press. To O.C.S.	Temp. °F To C.S.	Temp. To O.C.S.	From Turbine	1
1																									
2	17700		21.7		20.12		76	281		22.34	122	146	163		58	76	28	210		17.4				669	809
3																									
4																									
5	17625		21.4		19.35		92	294		21.57	124	149	164		58	77	27.5	212		16.76				690	831
6	17750		22.3		20.11		92	297		22.29	124	148	164		58	77	27.5	213		17.39				679	822
7	17700		21.6		19.56		92	297		21.79	125	150	165		58	77	27.5	212		16.95				692	835
8	17700		21.1		19.36		93	295		21.6	124	149	164		58	77	27.5	212		16.8				693	829
9	17750		21.7		19.41		93	296		21.69	125	149	164		58	77	27.5	212		16.8				691	828
10	17750		21.1		19.45		93	296		21.7	125	149	164		58	77	27.5	212		16.85				691	829
11	17750		21.3		19.42		93	296		21.65	124	149	164		58	77	27.5	212		16.8				691	828
12			21.4		19.4		93	296		21.65	124	149	164		58	77	27.5	212		16.8				691	831
13	17750		21.4		19.35		92	294		21.62	124	149	164		58	77	27.5	212		16.8				691	830
14	17750		21.5		19.4		91	293		21.68	123	149	165		58	77	27.5	212		16.8				689	829
15	17750		21.2		19.46		90	292		21.73	123	148	164		58	77	27.5	212		16.85				687	828
16	17750		21.3		19.58		88	290		21.86	123	148	164		58	76	27.5	211		16.94				685	822
17	17750		21.6		20.15		86	292		22.35	124	149	165		58	77	27.5	212		17.38				686	827
18	17750		22.4		20.34		84	290		22.45	124	149	165		58	77	27.5	212		17.46				683	824
19	17750		22.4		20.49		80	287		22.61	125	149	164		60	79	27.5	213		17.61				679	821
20	17775		21.9		20.56		79	286		22.7	126	150	164		60	80	27.5	212		17.65				676	821
21																									
22																									
23																									
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33																									
34																									

FOLD

SHIFT: 0700-1500 DATE: 4-22-80 TESTER: MASON HR. MTR 22481.8 K.W. MTR 3945 F.O. MTR. 0270499

SHIFT: 1500-2300 DATE 4-22-80 TESTER Boot

REMARKS:

REMARKS:

CYLINDER TEMP. °F								SEA H2O							In H.O.				AIR FLOW					FOLE
2	3	4	5	6	7	8	9	PD 10 PSI	IN 11 °F	OUT 12 °F	Combined Exhaust 123	Combined Exhaust 456	Combined Exhaust ~~789~~ 1-6	Combined Exhaust 10-11-12	Back Press.	Color	Bosch		Inlet °F	Inlet H2O	ΔP H2O	#/MIN	F/A Ratio	Line No.
																								1
816	756	870	898	794				30	75	88	859	906	883		8.1		.4		76	4.8	9.8	544.5	.02362	2
																								3
																			91					4
831	778	884	923	824				32	85	97	885	922	904		8.0		.5		91	5.0	9.6	530.3	.02433	5
834	779	876	906	812				32	86	98	874	914	894		8.2		.45		91	5.3	10.1	543.3	.02334	6
845	794	891	926	827				32	87	99	888	931	910		7.9		.60		93	5.1	9.8	534.2	.02416	7
831	789	887	928	829				32	87	99	886	927	907		7.9		.60		93	5.1	9.8	534.0	.02417	8
831	790	883	929	829				32	87	99	885	926	906		7.8		.60		94	5.1	9.8	533.6	.02419	9
832	789	885	929	829				32	87	99	887	926	907		8.2		.60		94	5.0	9.8	533.5	.02418	10
830	786	883	928	828				32	87	100	886	925	906		7.9		.60		94	5.0	9.6	528.8	.02437	11
834	788	884	926	830				22	88	100	888	925	907		8.6		.40		94	5.1	9.7	530.6	.02434	12
834	789	887	926	832				32	88	100	887	926	907		8.4		.40		93	5.1	9.6	528.2	.02434	13
831	787	883	921	830				32	88	100	886	922	905		7.6		.55		92	5.1	9.8	534.2	.02412	14
833	788	880	919	828				32	88	100	884	920	903		8.1		.60		92	5.0	9.7	531.5	.02422	15
827	781	879	916	823				32	88	100	880	918	900		7.8		.60		90	4.9	9.6	539.9	.02437	16
833	784	882	918	826				32	88	100	885	921	903		8.6		.59		88	5.3	9.9	538.9	.02407	17
830	780	877	917	824				32	88	100	882	918	901		8.4		.65		85	5.2	10.0	543.6	.02396	18
827	778	876	911	821				32	89	101	874	915	898		8.2		.50		82	5.3	10.0	544.7	.02388	19
828	779	870	907	832				32	90	102	877	912	895		8.2		.55		80	5.4	10.1	548.3	.0237	20
																								21
																								22
																								23
																								24
																								25
																								26
																								27
																								28
																								29
																								30
																								31
																								32
																								33
																								34

HR. MTR. 22488.5 K.W. MTR. 3453 F.O. MTR. 0277115

SHIFT: 2300 DATE: TESTER: HR. MTR. K.W. MTR. F.O. MTR.

REMARKS:

BF - 4173C

Ignition or Injection Timing	35.9 C.S.
Comp. Ratio	35.9 O.C.S.
Gas Cam Timing 137°BIDC @ .020 LIFT	
Crankled 18°LL	
K. W. Mtr. Constant 1200	
MOBIL GAURD 446	
#2 Shop F/O	

TEST LOG
EXPERIMENTAL DEPT.

TEST: Baseline Sulfate Test

ENGINE 8-6 8½x10 TURBO ENGINE NO. 87247

LOG NO. 4536

DATE: 4-24-80

POWER PARTS
C. RING
LINERS
PISTONS
SPECIAL

			ENGINE POWER OUTPUT								MISCELLANEOUS				ENGINE AIR				ENGINE H. O.			ENGINE			
															Press.		Temp.		PSIG	Temp. °F		Press.-PSIG			
															In HG	In H.O.	°F	°F							
Line No.	Time & Shift	Hour Meter Add 22500	RPM 900	Sec. for 20 Turns (KW)	KW Meter % Reg.	Alt. KW Output	Alt. Eff. %	BHP	% Load	#1 Pump Rack C.S./O.C.S	Room Temp.	Corrected Barometer	C. C. Vacuum	Gov. Load Limit	Air Receiver	Blower Suction	Air Inlet	Air Receiver	Pump Disch.	To Engine	From Engine	Pump Disch.	To Strainer	To Engine	Upper Header
1	CHECKED TIMING CS = 35.9 OCS = 35.5																								
2	0700-1500 Checked INJ. Timing - 36.2 CS. - 36.45 OCS. ADVANCED Timing 1/4 FLAT. NOW 35.9 C.S.																								
3	36.25 O.CS. @ 0820 HRS. START ENG. - WARMING - @ 0830 HRS. ON-LINE 100% LOAD.																								
4	0935	06.5	901	57.58	99.8	1504	96.0	2099	99.43	9.0/9.2	97	29.11	1.5	R.S.	23.6	21.69		148	44	155	159	60.5	46	45	36.3
5	1005	07.0	900	57.97	99.8	1493	96.0	2085	99.26	9.0/9.2	102	29.11	1.6	R.S.	23.5	21.55		148	44	156	159	60.5	45.5	44.5	36.1
6	1030	07.4	900	57.49	99.8	1506	96.0	2102	100.1	9.1/9.3	99	29.10	1.5	R.S.	23.45	21.66		148	44	155	159	60.5	45.5	44.5	36.1
7	1100	07.9	900	57.66	99.8	1501	96.0	2096	99.8	9.1/9.3	103	29.09	1.6	R.S.	23.5	21.59		149	44	156	159	60	45.5	44	36
8	1130	08.4	900	[illegible]	99.8	1504	96.0	2100	100	9.2/9.1	99	29.10	1.5	R.S.	23.67	21.69		149	44	156	159	60	45	44	36
9	1200	08.9	900	57.79	99.2	1493	96.0	2091	99.57	9.2/9.1	80	29.09	1.6	R.S.	23.46	21.45		148	44	156	160	60	45	44	36
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19368 H.H.V.

E OIL			FUEL OIL						NATURAL GAS FUEL															
Temp. °F			PSIG						Press. "HG		Temp.								Press.-PSIG					
To Engine	From Engine	Level in C.C.	Fuel Header	Sec. For Lbs. of Fuel	Fuel Cons Lbs./Hr.	Fuel Rate Lbs./BHP-Hr.	Corrected 19350 LB/BHP/HR	Fuel Rate BTU/BHP-Hr.	Meter Inlet	Meter Inlet ABS	Meter Inlet °F	Meter Inlet ABS °B	Sec. for Ft.³ Gas	Ft.³/Hr. @ Std. Temp. & Press.	Gas Heat Value BTU/Ft.³	Gas Consumption BTU/Hr. x 10³	Specific Gas Fuel Rate BTU/BHP-Hr.	Total Specific Fuel Rate BTU/BHP-Hr.	Supply To Engine	Cell Hdr.	Engine Hdr.			Line No.
																								1
																								2
																								3
																								4
165°	184	-11	16.4	236.7	760.5	.3623	.3626																	5
165	185	-11	16.4	239.19	757.7	.3624	.3628																	6
165	185	-10	16.5	237.13	759.1	.3611	.3615																	7
165	185	-12	16.5	236.9	763.0	.3640	.3648																	8
166	185	-12	16.5	235.9	764.4	.3646	.3649																	9
165	185	-13	16.5	236.-	761.1	.3639	.3643																	10
																								11
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OLD Line No.	TURBO RPM		COMPRESSOR AIR							BLOWER			WATER				LUBE OIL			TURBINE EXHAUST					
			Pressure				Temp. °F						Temps. °F				PSIG	Temp. °F		Press. "HG		Temp. °F			
			To Comp In H2O		From Comp. In PSI		Inlet	From Comp.		DISCH	SUCT	DISCN	From Turbo.		Air Cooler		Turbo. Inlet	From Turbo.		To		To		From Turbine	1
	C. S.	O. C. S.	C.S. H2O	O.C.S.	C.S. PSI	O.C.S.		C.S.	O.C.S.	PSI	°F	°F	C.S.	O.C.S.	In	Out		C.S.	O.C.S.	C.S.	O.C.S.	C.S.	O.C.S.		
1																									
2																									
3																									
4	17500		22.9		22.05		42	243		~~[illegible]~~ 23.76	126	147	161		59	95	28.2	208		18.45				621	768
5	17500		22.7		21.9		44	245		23.7	126	147	161		59	94	28.1	209		18.3				622	770
6	17525		22.9		21.98		45	247		23.79	126	147	162		59	94	28.1	209		18.41				624	773
7	17500		22.9		21.98		46	248		23.8	126	148	162		59	95	28	209		18.41				626	775
8	17500		22.5		21.96		48	250		23.8	127	148	162		59	94	28	210		18.4				630	781
9	17500		22.3		21.75		49	251		23.61	126	148	162		58	95	28	209		18.24				629	784
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SHIFT: 0700 -1500 DATE: 4-24-80 TESTER: MASON HR. MTR. 22505.1 K.W. MTR. 3974 F.O. MTR. 0273610

REMARKS:

SHIFT: 1500 DATE: TESTER:

REMARKS:

CYLINDER TEMP. °F						SEA H2O									In H.O.				AIR FLOW DATA					FOLI
2	3	4	5	6	7	PD 8 PSI	IN 9 °F	OUT 10 °F	11	12	123 Combined Exhaust	456 Combined Exhaust	~~789~~ 1-6 Combined Exhaust	10-11-12 Combined Exhaust	Back Press.	Color	BOSCH		INLET °F	INLET H2O	ΔP H2O	#'s/MIN	F/A RATIO	Line No.
																								1
																								2
																								3
769	717	816	845	763		29	63	75			812	852	833		8.0		.35		38	5.4	10.4	582.3	.02177	4
771	717	819	843	763		29	65	78			814	852	834		8.2		.30		39	5.4	10.3	578.8	.02175	5
776	723	820	848	769		32	65	77			818	855	837		8.3		.25		40	5.4	10.4	581	.02177	6
777	726	820	849	773		28.5	66	79			821	852	839		8.3		.30		41	5.4	10.4	580.3	.02191	7
783	735	825	846	771		29	70	84			827	857	843		8.3		.30		43	5.1	10.4	571.5	.02171	8
787	730	823	844	770		29	74	87			830	857	844		8.6		.25		45	5.10	10.2	572.7	.02215	9
																								10
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HR. MTR. K.W. MTR. F.O. MTR.

SHIFT: 2300 DATE: TESTER: HR. MTR. K.W. MTR. F.O. MTR.

REMARKS:

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BF-4173C

Ignition or Injection Timing 35.8 CS → 42
Comp. Ratio 36.15 OCS
Gas Cam Timing 137° BTDC @ .020 Lift
Crankled 18° CC
K. W. Mtr. Constant 1200
MOBIL GAURD N46
#2 Shop F/O

TEST LOG
EXPERIMENTAL DEPT.

LOG NO. 4535
DATE: 4-23-80

POWER PARTS
C. RING
LINERS
PISTONS
SPECIAL

TEST: EMISSION Test No. 2 DIESEL Controlled
ENGINE E-6 8½ x 10 TURBO ENGINE NO. 87247

			ENGINE POWER OUTPUT								MISCELLANEOUS				ENGINE AIR				ENGINE H. O.			ENGINE I			
															Press.		Temp.		PSIG	Temp. °F		Press.-PSIG			
															In HG	In H.O.	°F	°F							
Line No.	Time & Shift	Hour Meter Add	RPM 900	Sec. for 20 Turns (KW)	KW Meter % Reg.	Alt. KW Output	Alt. Eff. %	BHP	% Load	#1 Pump Rack C.S./O.C.S.	Room Temp.	Corrected Barometer	C. C. Vacuum	Gov. Load Limit	Air Receiver	Blower Suction	Air Inlet	Air Receiver	Pump Disch.	To Engine	From Engine	Pump Disch.	To Strainer	To Engine	Upper Header
1	@ 0715-		START-		WARMING-			0730	HRS.		ON-LINE		100%		DIESEL.		RETARDON		Timing		(4)	FULL	TURNS.		
2	0828	95.2	900	57.53	99.8	1505	96.0	2100	100	9.8/10.0	97	29.18	1.0	R.S.	25.59	23.32		150	44	155	159	60.5	45	44	36.3
3	0930	96.2	900	57.92	99.8	1495	96.0	2086	99.35	9.2/10.0	99	29.17	1.0	R.S.	25.4	23.19		150	44	156	159	60.3	45	44	36.2
4	1000	96.7	900	57.58	99.8	1504	96.0	2099	99.93	9.8/10.0	98	29.17	1.0	R.S.	25.53	23.33		151	44	156	159	60.3	45	44	36.2
5	1030	97.2	900	58.06	99.8	1491	96.0	2031	99.11	9.5/10.0	95	29.17	1.1	R.S.	25.32	23.09		150	44	156	159	60.3	45	44	36.3
6	1100	97.7	900	57.49	99.8	1506	96.0	2102	100.09	10.0/10.2	98	29.15	1.0	R.S.	25.64	23.41		152	44	156	159	60.2	45	44	36.1
7	1130	98.2	900	57.9	99.8	1495	96.0	2087	99.38	10.0/10.2	92	29.15	1.0	R.S.	25.45	23.22		151	44	156	159	60.2	45	44	36
8	1200	98.7	900	57.68	99.8	1501	96.0	2095	99.76	10.0/10.2	91	29.14	1.0	R.S.	25.46	23.24		151	44	156	159	60.2	45	44	36
9	1230	99.2	900	57.77	99.8	1499	96.0	2092	99.6	10.0/10.2	92	29.11	1.0	R.S.	25.35	23.1		151	44	156	160	60.1	45	44	36
10	1300	99.7	900	57.5	99.8	1506	96.0	2102	100.07	10.0/10.2	91	29.10	1.0	R.S.	25.41	23.19		152	44	156	160	60	45	44	36
11	1330	00.2	900	56.93	99.8	1520	96.0	2122	101.0	10.0/10.2	90	29.09	.8	R.S.	25.5	23.24		153	44	156	160	60	45	44	36
12	1400	00.7	900	57.5	99.8	1505	96.0	2102	100.07	9.5/10.0	92	29.07	1.0	R.S.	25.45	23.19		154	44	156	160	60	45	44	36
13	1430	01.2	900	57.5	99.8	1505	96.0	2102	100.07	9.0/10.0	94	29.06	1.0	R.S.	25.32	23.05		153	44	156	160	60	45	44	36
14		0	900	57.6	99.8		96.0																		
15	1505	01.8	900	57.6	99.8	1503	96.0	2098	99.9	9.0/10.0	92	29.05	.9	RS	25.34	23.05		153	44	156	160	60	45	43.5	36
16	1535	02.3	900	57.28	99.8	1509	96.0	2106	100.3	9.8/10.1	90	29.04	.8	RS	25.35	23.1		153	44.5	156	160	60	45	43.5	36
17	1605	02.8	900	57.25	99.8	1510	96.0	2107	100.33	10.0/10.1	95	29.04	.9	RS	25.41	23.45		153	44.5	157	160	60	45	43.9	36
18	1635	03.3	900	57.41	99.8	1508	96.0	2105	100.23	10.0/10.1	93	29.04	.8	RS	25.4	23.15		153	44.5	156	160	61	45	44	36.5
~~19~~	ADDED		113.5 #		MOBIL		GAURD		TO ENG.																
20	1705	03.8	900	57.54	99.8	1505	96.0	2100	100.0	10.0/10.1	94	29.03	1.0	RS	25.34	23.07		153	44.5	156	160	61	45	44	36.8
21	1735	04.3	900	57.58	99.8	1504	96.0	2099	99.93	10.0/10.1	91	29.02	1.0	RS	25.45	23.19		154	44.5	157	160	60.5	45	44	36.1
22	1805	04.8	900	57.6	99.8	1503	96.0	2098	99.9	10.0/10.1	91	29.02	1.0	RS	25.45	23.19		153	44.5	156	160	60.5	45	44	36
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19368 HNK

OIL			FUEL OIL						NATURAL GAS FUEL															
Temp. °F			PSIG						Press. "HG		Temp.								Press.-PSIG					
To Engine	From Engine	Level in C.C.	Fuel Header	Sec. For Lbs. of Fuel	Fuel Cons Lbs./Hr.	Fuel Rate Lbs./BHP-Hr.	Corrected 19350 LB/BHP/HR	Fuel Rate BTU/BHP-Hr.	Meter Inlet	Meter Inlet ABS	Meter Inlet °F	Meter Inlet ABS °B	Sec. for Ft.³ Gas	Ft.³/Hr. @ Std. Temp. & Press.	Gas Heat Value BTU/Ft.³	Gas Consumption BTU/Hr. x 10³	Specific Gas Fuel Rate BTU/BHP-Hr.	Total Specific Fuel Rate BTU/BHP-Hr.	Supply To Engine	Cell Hdr.	Engine Hdr.			Line No.
																								1
165	184	-65	15.8	225.82	797	.3795	.3799																	2
165	184	-67	16.1	226.22	792.7	.3814	.3818		(START EXHAUST EMISSION TEST 09:30 HRS.)															3
165	184	-71	16.3	225.89	796.8	.3796	.3799																	4
165	183	-72	16.1	225.59	797.4	.3793	.3787																	5
165	184	-72	16.1	225.56	798	.3796	.3799																	6
165	184	-73	16.0	227.94	789.7	.3784	.3787																	7
165	184	-73	16.0	226.81	793.6	.3788	.3791																	8
165	184	-73	16.0	226.56	794.5	.3797	.3801																	9
165	185	.73	16.1	225.27	799	.3801	.3805																	10
166	185	-74	16.0	223.47	800.4	.3795	.3799																	11
166	185	-76	16.0	224.22	802.8	.3819	.3823																	12
166	185		16.1	223.45	805.4	.3831	.3835																	13
																								14
166	185	-76	16.0	227.14	792.5	.3777	.3781																	15
166	186	-77	16.5	225.46	798.4	.379	.3794																	16
167	186	-79	16.1	225.26	799	.3712	.3716																	17
166	185	-80	16.2	225.23	799.2	.3797	.3800																	18
																								19
165	185	-8	16.0	225.86	797	.3795	.3799																	20
166	185	-8	16.0	225.76	796.7	.3796	.3791																	21
166	185	-6	16.0	226.23	795.7	.3792	.3796																	22
																								23
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Line No.	TURBO RPM C.S.	TURBO RPM O.C.S.	COMPRESSOR AIR Pressure To Comp In PSI C.S. PSI 20	COMPRESSOR AIR Pressure To Comp In O.C.S.	COMPRESSOR AIR Pressure ~~To~~ From Comp. Comp. In PSI C.S. PSI	COMPRESSOR AIR Pressure Comp. In O.C.S.	COMPRESSOR AIR Temp. °F Inlet	COMPRESSOR AIR Temp. °F From Comp. C.S.	COMPRESSOR AIR Temp. °F From Comp. O.C.S.	BLOWER DISCH PSI	BLOWER SUCT °F	BLOWER DISCH °F	WATER Temps. °F From Turbo. C.S.	WATER Temps. °F From Turbo. O.C.S.	WATER Temps. °F Air Cooler In	WATER Temps. °F Air Cooler Out	LUBE OIL PSIG Turbo. Inlet	LUBE OIL Temp. °F From Turbo. C.S.	LUBE OIL Temp. °F From Turbo. O.C.S.	TURBINE EXHAUST Press. "HG To C.S.	TURBINE EXHAUST Press. "HG To O.C.S.	TURBINE EXHAUST Temp. °F To C.S.	TURBINE EXHAUST Temp. °F To O.C.S.	From Turbine	1
1																									
✗ 2	18325		24.8		23.62		58	277		25.69	127	150	163		57	56	28	212		20.19				653	815
3	18300		25.1		23.55		59	277		25.59	127	149	162		57	77	28	212		20.06				654	815
4	18300		25.3		23.61		59	279		25.63	127	150	163		57	77	28	212		20.15				655	817
5	18250		25.1		23.45		59	276		25.45	126	149	163		57	76	28	212		20.0				653	817
6	18350		25.5		23.76		61	282		25.86	129	151	163		58	77	28	213		20.35				659	823
7	18350		24.3		23.59		61	281		25.64	128	151	163		58	77	28	212		20.16				658	823
8	18350		24.8		2351		63	283		26.1	128	151	163		57	77	28	212		20.14				660	825
9	18350		24.9		23.5		63	284		25.57	128	151	163		57	76	28	213		20.1				661	828
10	18350		25.1		23.55		64	286		25.61	129	152	163		58	77	28	213		20.15				664	832
11	18500		24.7		23.52		67	289		26.4	130	153	163		58	77	28	213		20.16				665	836
12	18500		25.1		23.63		67	290		25.85	131	154	164		58	77	28	214		20.39				672	836
13	18450		24.6		23.38		66	287		25.15	130	153	163		58	77	28	214		20.06				668	831
14																									
15	18450		24.8		2348		66	287		25.5	130	153	163		58	77	28	214		20.02				667	830
16	18500		24.6		2345		66	288		25.55	130	153	164		58	77	28	214		20.05				667	830
17	18500		24.9		2346		66	288		25.6	130	153	164		58	77	28	214		20.1				668	830
18	18500		24.7		2347		66	287		25.6	130	153	163		58	77	28.3	214		20.1				768	830
~~19~~																									
20	18500		24.8		234		66	287		25.5	130	153	163		58	77	28.3	213		20.07				666	833
21	18420		24.8		23.5		65	287		25.6	130	153	164		57	77	28.1	213		20.12				667	831
22	18450		24.7		2355		65	287		25.63	130	153	164		56	77	28.0	213		20.15				666	830
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FOLD

SHIFT: 0700 - 1500 DATE: 4-23-80 TESTER: MASON HR. MTR 22494.1 K.W. MTR 2960 F.O. MTR. 027334

REMARKS:

SHIFT: 1500 -2300 DATE: 4-23-80 TESTER:

REMARKS:

CYLINDER TEMP. °F						SEA H2O									In H.O.				AIR FLOW DATA					FOL
2	3	4	5	6	7	8 PD PSI	9 IN °F	10 OUT °F	11	12	123 Combined Exhaust	456 Combined Exhaust	~~789~~ 1-6 Combined Exhaust	10-11-12 Combined Exhaust	Back Press.	Color	BOSCH		INLET T °F	INLET H2O	ΔP H2O	M's/MIN	F/A RATIO	Line No.
																								1
826	763	860	892	810		32	66	78			863	901	882		9.8		.8		54	6.0	11.5	602.9	.022203	2
825	762	862	896	912		32	68	80			861	901	882		10.4		.7		55	6.0	11.5	602.3	.022023	3
825	764	866	894	910		32	69	81			863	903	894		10.2		.6		55	6.0	11.5	602.3	.022205	4
827	762	857	887	805		32	70	82			864	896	881		9.9		.65		55	5.9	11.5	602.3	.021789	5
831	766	870	899	814		32	71	83			870	908	890		10.3		.70		57	6.1	11.6	602.9	.022046	6
830	767	866	895	812		32	72	84			870	906	888		10.3		.70		58	6.0	11.5	600.3	.021922	7
832	771	869	896	810		32	72	84			872	908	890		9.9		.65		59	5.9	11.5	599.7	.022068	8
834	768	865	897	811		32	75	87			875	907	891		10.3		.70		60	5.5	11.5	599.1	.022109	9
838	773	870	903	819		32	75	87			870	912	896		10.5		.80		61	6.0	11.5	599.0	.022227	10 ←
844	777	874	910	824		32	76	88			876	920	903		10.3		.70		64	6.0	11.6	598.8	.02241	11
846	782	880	917	837		32	77	89			886	924	906		10.4		.70		63	6.0	11.5	596.6	.02248	12
841	779	877	911	835		32	77	90			879	915	900		10.0		.70		63	5.9	11.5	596.5	.02250	13
																								14
845	781	876	912	833		32	77	90			881	918	900		10.1		.60		64	6.0	11.6	598.4	.022207	15
844	779	877	912	833		32	78	91			881	918	900		10.3		.60		64	6.0	11.5	595.7	.022234	16
844	777	879	916	835		32	79	91			881	920	901		10.2		.60		64	5.5	11.6	598.4	.022236	17
843	776	877	920	839		32	79	91			880	920	901		10.7		.60		63	6.0	11.5	596.3	.022234	18
																								19
842	778	875	908	818		32	80	92			882	915	899		10.2		.60		63	6.0	11.5	596.2	.022258	20
842	779	877	917	835		32	80	93			881	920	901		10.2		.60		63	6.0	11.5	596.0	.022228	21
839	774	876	917	835			80	92			880	919	900		10.6		.65		63	5.6	11.6	599.0	.02214	22
																								23
																								24
																								25
																								26
																								27
																								28
																								29
																								30
																								31
																								32
																								33
																								34

H HR. MTR. 2501.6 K.W. MTR. 5969 F.O. MTR. 667320.5

SHIFT: 2300 DATE: TESTER: HR. MTR. K.W. MTR. F.O. MTR.

REMARKS:

SECTION 4

SAMPLING DATA SHEETS

This section includes data sheets for continuous monitoring of gaseous emissions (O_2, CO_2, NO, NO_x, and TUHC), particulate mass emissions using EPA's Method 5 and the Source Assessment Sampling System, and sulfur emissions using the modified High Volume Stack Sampler according to EPA Method 8 procedure. The field data sheets are arranged in the following order:

4.1 -- Continuous Monitoring Emission Data

4.2 -- Particulate Mass Emissions - High Volume Stack Sampler (HVSS)

4.3 -- Sulfur Emissions - Modified HVSS, Method 8

4.4 -- Trace Elements and Organics - Source Assessment Sampling System (SASS)

4.1 CONTINUOUS MONITORING EMISSION DATA

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UREX Aerotherm

FIELD DATA SHEET

COMPRESSION IGNITION ENGINE - DIESEL

Plant Fairbanks Morse - Colt IND.
Location Beloit, Wisconsin
Operator Joe Smith of Colt IND.
Date 4-22-80 BASELINE
Load Range 2100 Bhp

Ambient Temperature 88°F Average
Barometric Pressure 28.82 in Hg average
~~Static Pressure Duct~~ Humidity = 37%
Fuel No. 2 oil

Time	Sample Point			DRY UNCORRECTED							CORRECTED TO 15% O2 DRY			HYDROCARBONS (HC) PPm as Methane					COMMENTS
				O_2 %	CO_2 %	CO ~~%~~ ppm	SO_2 ppm	NO ppm	NO_x ppm	NO_2 ppm	NO ppm	NO_x ppm	NO_2 ppm	Total HC	Methane	Non Methane HC	H_2O %	Stack Gas Temp °F	
10:00				13.6	5.3	140		965	1000	35				30					
10:30				13.75	5.35	140		970	1010	40				30					
11:30				13.7	5.35	140		980	1020	40				25					
13:20	Engine Exhaust ahead of muffler			13.6	6.4	140		1000	1030	30				25					
13:30				13.75	5.3	130		990	1025	35				30					
14:00				13.5	5.4	150		–	1100	–				35					
14:30				13.6	5.35	140		980	1000	20				30					
15:00				13.75	5.4	135		1020	1150	130				37					Start of SASS & M5 trains
15:30				13.5	5.4	150		–	–	–				37					
16:00				13.7	5.4	140		975	1000	25				40					
17:00				13.5	5.4	170		978	1000	22				37					
18:00				13.5	5.4	140		965	975	10				35					
19:00				13.7	5.3	130		965	1000	35				33					
19:30				13.7	5.4	150		965	990	25				23					
20:00				13.7	5.3	160		1025	1050	25				22					
20:30				14.0	5.3	120		950	955	5				28					
				13.7	5.3	145		980	1015	35	805	831	29	32					AVERAGE
																			Over duration of SASS
																			and M5 tests

Form EED 063 12/78

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'JREX Aerotherm

FIELD DATA SHEET

Compression - Ignition Engine - Diesel

Plant Fairbanks Morse - Colt Ind.
Location Beloit, Wisconsin
Operator Joe Smith of Colt Industries
Date 4-23-80 Controlled NOx
Load Range 2101 Bhp

Ambient Temperature 46-66 °F (63 °F average)
Barometric Pressure 29.03 in Hg average
~~Static Pressure Duct~~ Humidity = 45%
Fuel No. 2 Fuel Oil

				DRY UNCORRECTED							CORRECTED TO 15% O2 DRY			HYDROCARBONS (HC)					
Time	Sample Point			O2 %	CO2 %	CO ~~%~~ ppm	SO2 ppm	NO ppm	NOx ppm	NO2 ppmn	NO ppm	NOx ppm	NO2 ppm	Total HC	Methane	Non-Methane HC	H2O %	Stack Gas Temp °F	COMMENTS
9:30				14.3	4.7	85	–	630	650	20				42					
10:00				14.35	4.7	80		615	635	20				32					
10:30				14.4	4.86	70		605	620	15				27					
11:00	ENGINE EXHAUST AHEAD OF MUFFLER			14.3	4.9	85		600	620	20				30					Start of tests ↓
11:30				14.3	4.7	85		580	610	30				25					
12:00				14.3	4.9	75		580	610	30				25					
12:30				14.3	4.7	75		590	610	20				27					
13:00				14.25	4.78	80		610	630	20				25					
13:30				14.2	5.0	90		630	640	10				17					
14:00				14.2	5.0	120		650	670	20				37					
14:30				14.2	5.0	105		640	660	20				28					
15:00				14.2	4.7	115		630	650	20				21					
15:30				14.25	5.0	110		650	677	27				26					
16:00				14.25	5.0	115		640	670	30				31					
16:30				14.25	5.0	110		650	670	20				28					
17:00				14.3	5.0	110		650	670	20				35					
17:30				14.25	5.0	115		640	660	20				25					
18:00				14.25	5.0	110		640	660	20				25					
				14.3	4.75	100		625	645	20	560	575	18	27					AVERAGE
																			Ave. duration of SASS and
																			M5 test

Form EED-063 12/78

4.2 PARTICULATE MASS EMISSIONS -- HVSS

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PARTICULATE TEST FIELD DATA SHEET

Corporation

PAGE 1 OF —

Plant COLT INDUSTRIES
Date 4/22/80
Test Location DIESEL - BASELINE
Run Number METHOD-5
Stack Diameter inches 15·375
Duct Dimensions in x in 185·66
Start Time 1459
Operator REHDER

Barometric Pressure 28·90
Static Pressure + 3·0
Stack Pressure 29·31
Probe Number 5 FT. STAINLESS
Pitot Coefficient ·841
Pitot Number 50 SIDE B
Meter Box Number 0038
Orifice Coefficient ·741/·999

Nozzle Size & Number ·185"
Molecular Weight 29.4 DRY
BWO ASSUMED ·03

FILTER DATA

NUMBER	TARE	FINAL WT
A-31		

IMPINGER VOLUMES		TIME	CO₂	O₂	CO
400	513				
400	455				
SILICA GEL					
300	332.5				

S-1

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in wg	ORIFICE METER ΔH in wg	GAS METER VOLUME FT³	TEMPERATURES °F							PUMP VACUUM in Hg	$\sqrt{\Delta P}$	INT LEAK CK 0.0 FT³/MIN @ 15 in Hg.
					STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT			
INIT	0 / 1459	-	-	794·828	-	-	-	-	-	94	94	-		
1	5 / 1504	5·4	3·4	800·18	600	275	104	-	253	97	95	<·5		
2	10 / 1509	5·4	3·4	805·595	597	273	101	-	263	96	95	<·5		STOP IMPINGER
STOP														H2O LEVEL
START	10 / 1557	-	-	805·595	-	-	-	-	-	96	96	-		TOO LOW FOR STEAMS
3	15 / 1602	4·7	3·0	810·73	600	260	97	-	251	97	97	<·5		LK CK ·005 ~~ft³~~/sec.
4	20 / 1607	4·9	3·2	815·64	600	255	97	-	251	97	97	<·5		@ 17 in Hg
5	25 / 1612	5·4	3·5	820·79	598	240	95	-	251	97	97	<·5		·0037 FT³/MIN
6	30 / 1617	5·6	3·5	825·90	621	253	95	-	252	97	97	<·5		
7	35 / 1622	6·3	4·0	831·43	631	270	95	-	251	97	97	<·5		
8	40 / 1627	6·5	4·0	837·00	633	280	95	-	252	97	97	<·5		
9	45 / 1632	6·8	4·3	842·71	634	291	95	-	252	98	97	<·5		
10	50 / 1637	7·0	4·35	848·45	639	296	95	-	254	98	97	<·5		
11	55 / 1642	7·0	4·37	854·25	640	303	95	-	237	98	96	<·5		
12	60 / 1647	6·7	4·2	859·90	640	313	94	-	246	98	96	<·5		
13	65 / 1652	6·6	4·1	865·54	638	316	94	-	248	98	96	<·5		
14	70 / 1657	6·1	3·8	871·20	637	317	94	-	246	98	96	<·5		
15	75 / 1702	6·5	4·06	876·51	638	316	84	-	246	98	96	<·5		
16	80 / 1707	6·4	4·0	882·05	639	318	95	-	247	97	96	<·5		
17	85 / 1712	6·4	4·0	887·59	636	320	85	-	247	98	96	<·5		
AVG/TOTAL														

Corporation

PAGE 2 OF 2

PARTICULATE TEST FIELD DATA SHEET

Plant COLT INDUSTRIES
Date 4/22/80
Test Location DIESEL - BASELINE
Run Number METHOD -5
Stack Diameter inches
Duct Dimensions in x in
Start Time
Operator

Barometric Pressure
Static Pressure
Stack Pressure
Probe Number
Pitot Coefficient
Pitot Number
Meter Box Number
Orifice Coefficient

Nozzle Size & Number
Molecular Weight
BWO

FILTER DATA

NUMBER	TARE	FINAL WT

IMPINGER VOLUMES		TIME	CO₂	O₂	CO
SILICA GEL					

V-1

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in wg	ORIFICE METER ΔH in wg	GAS METER VOLUME FT³	TEMPERATURES °F STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in Hg	√ΔP	
18	90 1717	6.4	4.0	893.142	636	320	87	–	248	97	96	<.5		
START	90 1750													CHANGE PORTS
1	95 1755	4.1	2.63	897.90	601	220	70	–	246	93	93	<.5		
2	100 1800	4.1	2.64	902.81	598	220	70	–	243	93	93	<.5		
3	105 1805	4.3	2.75	907.76	600	221	71	–	246	92	93	<.5		HIT PUMP VALVE – VOL SHOT UP
4	110 1810	4.5	2.9	912.48	596	245	71	–	246	92	92	<.5		
5	115 1815	4.8	3.0	917.25	610	252	71	–	231	92	92	<.5		
6	120 1820	5.3	3.3	922.29	621	261	68	–	246	92	92	<.5		
7	125 1825	5.5	3.5	927.39	623	271	66	–	243	92	91	<.5		
8	130 1830	6.0	3.75	932.79	625	277	67	–	251	91	91	<.5		
9	135 1835	6.3	3.9	938.23	628	285	68	–	251	90	90	<.5		
10	140 1840	7.3	4.5	944.01	628	291	70	–	251	90	90	<.5		
11	145 1845	7.4	4.6	949.90	633	305	69	–	251	89	89	<.5		
12	150 1850	7.5	4.6	955.45	635	314	68	–	249	89	89	1.0		
13	155 1855	7.4	4.56	961.88	635	317	68	–	250	89	88	1.0		
14	160 1900	7.3	4.5	967.63	635	316	68	–	251	88	88	1.0		
15	165 1905	7.4	4.55	973.62	635	318	67	–	253	88	87	1.0		
16	170 1910	7.1	4.4	979.40	634	318	67	–	241	88	87	1.0		
17	175 1915	7.2	4.4	985.18	634	322	67	–	237	87	86	1.0		FINAL LK CK 0.0 FT³/MIN @ 15 in Hg
19	180 1920	7.0	4.3	990.947	314	319	67	–	256	87	86	1.0		
STOP AVG/TOTAL		√=2.47	3.83	96 119	623					44	43			

Form FED 021 1/79

K Corporation

PARTICULATE TEST FIELD DATA SHEET

Plant COLT INDUSTRIES
Date 4/23/80
Test Location DIESEL-CONTROL
Run Number 2-METHOD 5
Stack Diameter inches 15.375
Duct Dimensions in x in 185.66
Start Time 1058 HRS
Operator RENDER

Barometric Pressure 29.18
Static Pressure + 3.2
Stack Pressure 29.42
Probe Number 5FT STAINLESS
Pitot Coefficient .841
Pitot Number 50 SIDE B
Meter Box Number OC34
Orifice Coefficient K .741/.999

Nozzle Size & Number (.185")
Molecular Weight 29.4 DRY
BWO ASSUMED .03

FILTER DATA

NUMBER	TARE	FINAL WT
A-21		

	IMPINGER VOLUMES		TIME	CO₂	O₂	CO
1	400	587				
2	400	430				
	SILICA GEL					
	600	27.9	NET			

3-1

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in wg	ORIFICE METER ΔH in wg	GAS METER VOLUME FT³	TEMPERATURES °F STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in Hg	√ΔP	LK. CHECK .011/min @ 15 in Hg
INIT	0 / 1058	–	–	994.134	–	–	–	–	–	70	70	–		
1	5 / 1103	4.9	3.0	998.68	585	245	67	–	231	67	69	2.5		IMPINGER T.C
2	12 / 1108	6.4	3.9	1003.47	590	245	85	–	285	67	69	4.0		SHORTED OUT
3	15 / 1113	5.3	3.2	1008.85	595	232	87	–	258	67	69	3.0		SOME VALUES HIGH
4	20 / 1118	6.5	3.9	1013.86	595	242	68	–	229	66	69	4.0		
5	25 / 1123	7.3	4.5	1019.28	590	256	68	–	225	68	69	4.5		
6	30 / 1128	7.5	4.6	1025.06	590	275	62	–	273	68	69	5.0		
7	35 / 1133	7.6	4.6	1030.98	608	284	72	–	259	69	69	5.0		FIXED TC.
8	40 / 1138	8.4	5.07	1036.86	610	285	76	–	227	69	70	5.5		
9	45 / 1143	8.5	5.1	1043.04	612	292	67	–	252	68	64	5.5		
10	50 / 1148	9.0	5.4	1049.29	615	298	68	–	229	69	68	6.0		
11	55 / 1153	8.8	5.3	1055.69	615	306	68	–	238	69	68	6.0		
12	60 / 1158	8.6	5.1	1062.06	614	311	68	–	238	69	68	6.0		
13	65 / 1203	8.5	5.1	1068.30	616	315	68	–	253	69	68	6.0		
14	70 / 1208	8.4	5.0	1074.48	614	315	65	–	245	69	68	6.0		
15	75 / 1213	8.3	5.0	1080.78	617	317	66	–	255	70	67	6.0		
16	80 / 1218	8.4	5.0	1086.91	614	317	63	–	255	71	67	6.0		
17	85 / 1223	8.2	4.9	1093.06	614	317	63	–	256	71	67	6.0		
18	90 / 1228	8.0	4.8	1099.15	614	316	62	–	255	71	67	6.0		CHANGE PORTS
STOP	93 / 1233	–	–	1103.214										
AVG/TOTAL														

ACUREX Corporation

PAGE 2 of 2

PARTICULATE TEST FIELD DATA SHEET

Plant COLT INDUSTRIES
Date 4/23/80
Test Location DIESEL - CONTROL
Run Number 2 - METHOD 5
Stack Diameter inches
Duct Dimensions in x in
Start Time
Operator

Barometric Pressure
Static Pressure
Stack Pressure
Probe Number
Pitot Coefficient
Pitot Number
Meter Box Number
Orifice Coefficient

Nozzle Size & Number
Molecular Weight
BWO

FILTER DATA

NUMBER	TARE	FINAL WT

IMPINGER VOLUMES		TIME	CO2	O2	CO
SILICA GEL					

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in wg	ORIFICE METER ΔH in wg	GAS METER VOLUME FT³	TEMPERATURES °F STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in Hg	√ΔP	
	93 / 1241	–	–	–	–	–	–	–	–	67	67	–		
1	95 / 1243	4.9	3.0	1105.35	586	228	58	–	229	67	67	4.0		
2	100 / 1248	4.9	3.0	1110.12	590	234	56	–	224	67	66	4.0		
3	105 / 1253	5.0	3.1	1114.92	590	246	57	–	275	67	66	4.0		
4	110 / 1258	5.1	3.6	1119.76	593	244	57	–	290	68	66	4.0		
5	115 / 1303	5.9	4.0	1124.97	612	258	58	–	290	69	66	4.5		
6	120 / 1308	6.7	3.9	1130.39	603	267	59	–	267	68	66	5.0		
7	125 / 1313	6.5	4.15	1135.84	610	275	59	–	250	70	66	5.0		
8	130 / 1318	6.9	5.0	1141.39	620	281	59	–	268	69	66	5.0		
9	135 / 1323	8.4	5.3	1147.44	617	297	60	–	246	70	66	6.5		
10	140 / 1328	8.9	5.25	1153.66	620	303	60	–	266	70	66	7.0		
11	145 / 1333	8.8	5.3	1159.98	621	308	60	–	243	70	66	7.0		
12	150 / 1338	8.9	5.4	1166.27	621	324	61	–	244	70	66	7.0		
13	155 / 1343	9.1	5.2	1172.66	622	329	61	–	246	71	65	7.5		
14	160 / 1348	8.7	5.1	1178.91	622	329	61	–	247	71	66	7.5		
15	165 / 1353	8.6	5.1	1185.11	620	327	61	–	248	70	66	7.0		
16	170 / 1358	8.6	5.1	1191.27	622	330	62	–	251	70	66	7.0		
17	175 / 1403	8.0	4.8	1197.25	620	331	63	–	248	71	65	7.0		
18	190 / 1408	7.8	4.7	1202.86	621	328	63	–	250	71	66	7.0		
										68				FINAL LK. CK. 0.0 FT³/MIN
AVG/TOTAL		√=2.73	4.56	203.676	614					64	67			@ 10 in Hg

4.3 SULFUR EMISSION DATA -- MODIFIED HVSS, METHOD 8

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K Corporation

PARTICULATE TEST FIELD DATA SHEET

Plant Colt Industries
Date 4/24/80
Test Location Diesel - Baseline
Run Number I - Method 8
Stack Diameter inches 15.375 avg.
Duct Dimensions in x in 185.66
Start Time 0931
Operator Render

Barometric Pressure 27.10 @ 0900
Static Pressure +7.0 "H_2O
Stack Pressure 29.32 in Hg
Probe Number 3FT Glass
Pitot Coefficient –
Pitot Number –
Meter Box Number 0038
Orifice Coefficient .714

Nozzle Size & Number (.185")
Molecular Weight 29.4 DRY
BWO Assumed (.03)

FILTER DATA

NUMBER	TARE	FINAL WT

	IMPINGER VOLUMES		TIME	CO_2	O_2	CO
IPA	200					
H_2O_2	200					
H_2O_2	200					
	SILICA GEL					
	300					

SAMPLE POINT PORTS 1	CLOCK TIME	VELOCITY HEAD ΔP in wg	ORIFICE METER ΔH in wg	GAS METER VOLUME FT³	TEMPERATURES °F STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in Hg	$\sqrt{\Delta P}$	
Init	0 / 0931		2.95	354.154						46	48	–	–	Start
5	15 / 0946	4.9	2.85	367.85	605		40		321	43	44	9.0	1.69	
5	30 / 1001	4.9	2.86	381.40	600		43		310	47	45	9.5	1.69	Silica impinger
5	60 / 1031	4.9	2.85	408.61	600		42		320	46	48	10.0	1.69	broken at an unknown
5	75 / 1046	4.9											1.69	time
5	91 / 1117	4.9	2.85	449.86	600		49		319	47	48	12.0	1.69	
5	152 / 1218	4.9	2.85	501.337	602		51		318	54	51	12.0	1.69	Stop
Purge	1332			519.001										
19 min	1951			530.000										Final LK.
														check was conducted
														from the third
														impinger 0.0FT3/min
														@ 15 in Hg.
				16.999 ft³/purge										
										(47.25)				
AVG/TOTAL	152.0	4.9	2.85	153.183	601.0		45			47.2	47.3		1.69	

ACUREX Corporation

PARTICULATE TEST FIELD DATA SHEET

Plant COLT INDUSTRIES
Date 4/23/80
Test Location DIESEL - CONTROL
Run Number 1 METHOD 8
Stack Diameter inches 15.375
Duct Dimensions in x in 186.66
Start Time 1536
Operator RAHDER

Barometric Pressure 29.18
Static Pressure + 3.2
Stack Pressure 29.42
Probe Number 3FT GLASS
Pitot Coefficient
Pitot Number N/A
Meter Box Number 0038
Orifice Coefficient .714

Nozzle Size & Number (.186")
Molecular Weight 29.4 DRY
BWO

FILTER DATA

NUMBER	TARE	FINAL WT

	IMPINGER VOLUMES		TIME	CO₂	O₂	CO
IPA	200					
H₂O₂	200					
H₂O₂	200					
	SILICA GEL					
	300					

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in wg	ORIFICE METER ΔH in wg	GAS METER VOLUME FT³	TEMPERATURES °F 300							PUMP VACUUM in Hg	√ΔP	
					STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER				
										IN	OUT			
BATS-1 5	0 / 1536	4.9	–	203.787	–	–	–	–	–	80	69	–	2.21	INITIAL
5	15 / 1556	4.9	3.0	218.15	612	245	62	–	308	75	70	13.5	2.21	LEAK CHECK .09 cfm
5	30 / 1606	4.9	3.0	231.90	613	255	63	–	310	73	69	13.5	2.21	@ 15" Hg
5	45 / 1621	4.9	3.0	246.83	612	249	67	–	311	74	69	13.5	2.21	
5	60 / 1636	4.9	3.0	260.45	612	251	70	–	311	74	69	14.0	2.21	
5	75 / 1641	4.9	3.0	274.38	611	257	67	–	312	72	68	14.0	2.21	
5	105 / 1709	4.9	3.0	292.01	612	260	64	–	310	71	68	14.0	2.21	
5	120 / 1724	4.9	3.0	306.08	613	247	64	–	309	70	67	15.0	2.21	
5	135 / 1734	4.9	3.0	320.22	612	246	60	–	309	69	67	15.0	2.21	
5	155 / 1759	4.9	3.0	338.90	611	244	55	–	312	70	66	16.0	2.21	
														FINAL LEAK
														CHECK .025/ MIN @
		PURGE												15 in Hg.
		1828		339.4										
		1844		351.602										
				12.202 ft³	PURGE									
										70.5				
AVG/TOTAL		4.9	3.0	135.114	612					72.8	68.2		2.21	

Form FED 021 1/79

4.4 TRACE ELEMENTS AND ORGANICS -- SASS

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Corporation

PARTICULATE TEST FIELD DATA SHEET

Plant COLT INDUSTRIES
Date 4/22/80
Test Location DIESEL-UNCONTROLLED
Run Number SASS #01
Stack Diameter inches 15.375
Duct Dimensions in x in
Start Time 1558
Operator KAUFMANN

Barometric Pressure 29.40
Static Pressure +3.0" H2O
Stack Pressure
Probe Number 3FT GLASS
Pitot Coefficient .84
Pitot Number 10
Meter Box Number 088
Orifice Coefficient 3.589/1.166

Nozzle Size & Number 369
Molecular Weight 29.4 (DRY)
BWO

FILTER DATA

NUMBER	TARE	FINAL WT
A56		

IMPINGER VOLUMES		TIME	CO_2	O_2	CO
500	510	INSTRUMENT DATA			
500	440		5.32	13.9	80.48
500	475				
SILICA GEL					
750	862				

	SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in wg	ORIFICE METER ΔH in wg	GAS METER VOLUME FT³	TEMPERATURES °F STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in Hg	$\sqrt{\Delta P}$	LEAK RATE
N-1	5	0	5.7	2.1	802.599	626	407	93	59	406	97	97	20/20	2.39	.023/10"
	5	20	5.7	1.9	884.9	624	422	93	63	405	103	98	20/20	2.39	
	STOP	40			962.378										CHANGE FILTER
	1646	40	5.7	2.2	962.379	626	410	93	58	378	96	95	17/17	2.39	A-10
	5	60	5.7	1.9	1045.30	633	427	92	56	406	105	96	20/20	2.39	MOVE TO PORT S-1
	STOP	80			1122.818										CHANGE FILTER
S-1	1752	80	5.2	2.2	1122.818	624	398	90	57	372	93	92	17/17	2.38	A-25
	5	100	5.2	1.8	1204.30	623	427	87	56	407	101	93	20/20	2.38	
	OFF	120			1281 875										
	1852	120	5.2	2.2	1281.875	623	425	86	60	337	86	85	17/17	2.39	CHANGE FILTER
	5	140	5.2	1.8	1372.4	623	425	83	64	400	95	87	20/20	2.39	A-3
	OFF	150			1411.137										
	1940	150	5.2	2.2	1411.137	616	393	80	67	338	83	85	17/17	2.28	CHANGE FILTER
	5	160	5.2	2.0	1456.8	617	423	79	72	404	95	95	20/20	2.28	A-6
	OFF	180			1534.311										FUEL LEAK
													FROM	PROBE	.055/10"
													FROM ORG MOD		.008/20"
	AVG/TOTAL	180	5.4	2.03	731.713	624					93			2.32	

ACUREX Corporation

PAGE 1 OF 2

PARTICULATE TEST FIELD DATA SHEET

Plant COLT INDUSTRIES
Date 4/23/80
Test Location DIESEL-CONTROLLED
Run Number SASS #2
Stack Diameter inches 15.375
Duct Dimensions in x in
Start Time 1110
Operator P. KAUFMANN

Barometric Pressure 29.18
Static Pressure +3.2" H2O
Stack Pressure 29.42
Probe Number
Pitot Coefficient .84
Pitot Number 10
Meter Box Number 088
Orifice Coefficient 3.589 /1.66

Nozzle Size & Number .369
Molecular Weight
BWO

FILTER DATA

NUMBER	TARE	FINAL WT
A-6		

IMPINGER VOLUMES		TIME	CO2	O2	CO
510	661		INSTRUMENT	DATA	
500	468		4.95	16.27	80.78
500	452				
SILICA GEL					
831.4	1052.8				

COND 448

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in wg	ORIFICE METER ΔH in wg	GAS METER VOLUME FT³	TEMPERATURES °F STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in Hg	√ΔP	LEAK RATE
	0	5.2	2.2	537.121	605	406	57	67	407	65	64	20/20	2.28	037/10"
	10	5.2	2.1	578.0	604	421	61	54	410	73	67	80/20	2.28	
	20	5.2	1.9	617.6	604	424	64	50	415	80	70	20/20	2.28	CHANGE FILTER
OFF	30			655.278										A-68
1150	30	5.2	2.2	655.278	602	417	59	53	383	72	72	17/17	2.28	
	40	5.2	2.0	695.	609	425	64	50	410	77	70	20/20	2.28	
	50	5.2	1.8	735.7	607	422	55	52	410	78	73	20/20	2.28	
OFF	60			774.044										
1237	60	6.2	2.2	774.044	606	407	61	56	372	76	76	17/17	2.49	CHANGE PORT CHANGE FILTER
	70	6.2	2.1	815	609	425	66	53	413	79	74	20/20	2.49	A-30
	80	6.2	1.8	856	610	418	63	52	409	82	78	20/20	2.49	
OFF	90			892.818										CHANGE FILTER
1333	90	6.2	2.2	892.818	616	415	65	55	327	72	75	17/17	2.49	A-38
	100	6.2	2.1		617	421	65	54	408	81	77	20/80	2.49	
	110	6.2	1.8	974.5	617	417	63	49	408	80	77	80/80	2.49	
OFF	120			1012.805										CHANGE FILTER
1417	120	6.2	2.2	1012.805	612	407	65	51	357	75	76	17/17	2.49	A-36
OFF	150			1130.254										
1500	150	6.2	2.2	1130.254	604	428	66	53	308	76	78	17/17	2.49	CHANGE FILTER
	160	6.2	2.1	1174.	611	425	66	51	405	85	79	20/20	2.49	A-23
AVG/TOTAL														

N-1

S.1

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PARTICULATE TEST FIELD DATA SHEET

Corporation

Plant COLT INDUSTRIES

Date 4/23/80

Test Location DIESEL-CONTROLLED

Run Number SASS #2

Stack Diameter inches

Duct Dimensions in x in

Start Time

Operator

Barometric Pressure

Static Pressure

Stack Pressure

Probe Number

Pitot Coefficient

Pitot Number

Meter Box Number

Orifice Coefficient

Nozzle Size & Number

Molecular Weight

BWO

FILTER DATA

NUMBER	TARE	FINAL WT

IMPINGER VOLUMES		TIME	CO2	O2	CO
SILICA GEL					

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in wg	ORIFICE METER ΔH in wg	GAS METER VOLUME ft³	TEMPERATURES °F							PUMP VACUUM in Hg	$\sqrt{\Delta P}$	
					STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER				
										IN	OUT			
	173	6.2	1.8	1223.7	611	421	67	48	400	83	80	20/20	2.49	
OFF	180			1250.965										CHANGE FILTER
1543	180	6.2	2.2	1250.965	611	420	62	52	347	76	78	17/17	2.49	A-52
	191	6.2	2.1	1296.7	612	426	74	53	409	84	79	20/20	2.49	
	200	6.2	1.9	1333.1	613	423	53	51	460	81	79	20/20	2.49	
OFF	210			1372.048										CHANGE FILTER
1622	210	6.2	2.2	1372.048	612	406	64	54	318	79	78	17 17	2.49	A-1
	220	6.2	2.0	1420.2	611	421	66	52	408	82	77	20 20	2.49	
	232	6.2	1.8	1460.1	612	420	64	52	412	83	78	20 20	2.49	
OFF	240			1491.212										FINAL LEAK
												THROUGH CYCLONES		.105/11"
												THROUGH ORG MOD		.009/21"
AVG/TOTAL	240		2.04	954.071	610					78			2.43	

SECTION 5

ANALYTICAL LABORATORY RESULTS

This section contains laboratory reports and calculations of analytical results for fuel and exhaust gas emissions samples collected from the compression ignition engine during baseline and controlled NO_x tests. The reports are presented in the following order:

5.1 -- Fuel and Lube Oil Analyses

5.2 -- Particulate Mass Samples and Data Reduction

5.3 -- Sulfur Emissions Data Reduction

5.4 -- Trace Elements

5.5 -- TCO, GRAV, and GC/MS Results, and Infrared Spectra of Total Sample Extracts

5.6 -- Gas Chromatography Data Reduction

5.7 -- LC Fractionation of Selected Extract Samples with TCO, GRAV, and IR Results on LC Fractions

5.8 -- LRMS Analyses of Selected LC Fractions and Total Sample Extracts

5.9 -- Bioassay Analysis Report

5.1 FUEL AND LUBE OIL ANALYSES REPORT

LABORATORY CERTIFICATE

CURTIS & TOMPKINS, LTD.

ESTABLISHED 1878

ANALYTICAL - CHEMISTS - CONSULTING

SAMPLERS — INSPECTORS

MEMBERS OFFICIAL CHEMISTS
AND/OR SAMPLERS FOR MANY
COMMODITY AND TRADE ORGANIZATIONS

CORPORATE OR STAFF MEMBERSHIP IN
PRINCIPAL SCIENTIFIC SOCIETIES

290 DIVISION STREET
SAN FRANCISCO, CALIF. 94103
U.S.A.

CABLE ADDRESS ANALYST

REFEREE ANALYSES
RESEARCH – INVESTIGATIONS
VITAMIN ASSAYS – BIOCHEMISTRY

SPECIALISTS IN BULK COMMODITIES

Laboratory No. 80k10
Preliminary No. 4132

Reported 10/6/80
Sampled -------
Received 9/8/80

For ACUREX CORPORATION

	Diesel oil -- baseline			Diesel oil -- low NO_x			Lube oil		
	1st test	2nd test	3rd test	1st test	2nd test	3rd test	1st test	2nd test	3rd test
Carbon (C), %	86.55	--	--	86.72	--	--	83.84	--	--
Hydrogen (H), %	12.28	--	--	12.42	--	--	12.80	--	--
Oxygen (O), by difference, %	0.93	--	--	0.63	--	--	2.34	--	--
Nitrogen (N), %	0.05	0.05	0.05	0.03	0.04	0.03	0.05	0.08	0.07
Sulfur (S), %	0.18	0.19	0.20	0.19	0.20	0.20	0.96	0.96	0.96
Heating Value: Btu/Pound	18,925	--	--	18,938	--	--	18,687	--	--
Gravity, °API @ 60°F	33.60	--	--	33.60	--	--	24.10	--	--

5.2 PARTICULATE MASS SAMPLES AND DATA REDUCTION

Compression Ignition Engine, Grams

Test	SASS train					Method 5 train			
						Solids		Condensables	
	Probe & nozzle rinse	10μ cyclone catch & rinse	3μ cyclone catch & rinse	1μ cyclone catch & rinse	Filter	Probe & nozzle rinse	Filter	Impinger inorganic	Impinger organics
Baseline	0.0913	0.0280	0.0163	0.0011	0.4597	0.0518	0.1461	0.0099	0.0123
Controlled NO_x	0.4115	0.0103	0.0152	0.0005	0.7923	0.0411	0.2152	--[a]	--[a]

[a] Impinger samples were lost during shipping

SASS BASELINE DIESEL

ACUREX
Corporation

PARTICULATE CALCULATIONS

1. Volume of dry gas sampled at standard conditions, 68° F, 29.92 inch Hg (scf)

$$Vm_{std} \quad 17.64\ \frac{Vm}{\alpha}\left(\frac{P_b + \frac{\Delta H}{13.6}}{T_{m,avg} + 460}\right) =$$

$$\text{or}\quad Vm_{stack} = \left(\frac{Vm}{\alpha} + Vw_{std}\right)\left(\frac{T_{s,avg} + 460}{T_{m,avg} + 460}\right)\left(\frac{P_m}{P_s}\right) \quad \text{(acf at stack conditions)}$$

$$= 17.64\ \frac{731.713}{1.166}\left(\frac{29.8 + \frac{2.33}{13.6}}{93 + 460}\right) = 579.5 \quad \text{dscf}$$

2. Stack gas moisture condensed at standard conditions (scf)

$$Vw_{std} = 0.04707\ Vl_c \quad = 0.04707\ (357)$$

$$= 16.804$$

3. Stack gas proportion of water vapor, by volume

$$B_{wo} = \frac{Vw_{std}}{Vw_{std} + Vm_{std}}$$

$$= \frac{16.804}{16.804 + 579.5} = 0.028$$

4. Stack gas dry molecular weight (lb/lb-mole)

$$MW_d = 0.44\ (\%CO_2) + 0.32\ (\%O_2) + 0.28\ (\%N_2 + \%CO)$$

$$= 0.44\ (5.3) + 0.32\ (13.7) + 0.28\ (81) = 29.396$$

5. Stack gas molecular weight (lb/lb-mole)

$$MW_s = MW_d\ (1 - B_{wo}) + 18\ (B_{wo})$$

$$= 29.396\ (1 - 0.028) + 18\ (0.028) = 29.077$$

6. Pressure stack, in. Hg

$$P_s = P_b + \frac{P_{st}}{13.6}$$

$$= 29.077$$

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7. Stack gas velocity at stack conditions (ft/sec)

$$V_s = 85.49\ (C_p)\ (\sqrt{\Delta P})_{avg} \sqrt{\frac{T_{s,avg} + 460}{P_s\ MW_s}}$$

$$= 85.49 (0.84)(2.32) \sqrt{\frac{624 + 460}{29.92\ (29.077)}} = 188.83$$

8. Stack gas volume at standard conditions (scfm)

$$Q_s = 60\ (1 - B_{wo})\ Vs_{avg}\ A_s \left(\frac{528}{T_{s,avg} + 460}\right)\left(\frac{P_s}{29.92}\right) = 60(1-0.028)(188.83)(1.2893)\left(\frac{528}{1084}\right)\frac{1}{k}$$

$$= 6707.8$$

or $Q_a = 60\ Vs_{avg}\ A_s$ (acfm) =

9. Test percent isokinetic

$$\%I = \frac{17.33\ (T_{s,avg} + 460)\ \ [0.04707\ (W_{lc}) + Vm_{std}]}{\theta\ V_s\ P_s\ D_n^2}$$

$$= 83\ \%$$

10. Particulate matter concentration, gr/scf

$$C_s = 15.432\ \frac{M_p}{Vm_{std}} = \frac{15.432}{579.5}\ .\quad (M_p) = 0.0266\ M_p$$

M_p: g

or $C_a = 15.432\ \dfrac{M_p}{Vm_{stack}}$ (gr/acf) =

11. Emission rate of particulate matter, lb/hr

$$ER = 0.00857\ (\acute{Q_s})\ \acute{C_s}$$

$$= 0.00857(6707.8)(0.0266)\ M_p = 1.5308\ M_p$$

12. Percent excess air at sampling point

$$\%\ EA = \frac{100\ [\%O_2 - 0.5\ (\%CO)]}{0.264\ \ \%N_2 - (\%O_2 - 0.5 \times \%CO)} =$$

	Probe + 10μ	3μ	1μ	filter	+.
catch M_p	0.1193	0.0163	0.0011	0.4597	0.
ER lb/hr	0.1826	0.0250	0.0017	0.7037	
[illegible]	0.0375	0.0054	0.0004	0.1521	0

13. Emission rate of particulate matter, lb/10⁶ Btu

$$E = 2.679 \times 10^4 \left(\frac{M_p}{Vm_{std}}\right) F \left(\frac{20.9}{20.9 - \%O_2}\right)$$

=

SASS - CONTROLLED NOx - DIESEL

ACUREX Corporation

PARTICULATE CALCULATIONS

1. Volume of dry gas sampled at standard conditions, 68° F, 29.92 inch Hg (scf)

$$Vm_{std} \quad 17.64 \frac{Vm}{\alpha}\left(\frac{P_b + \frac{\Delta H}{13.6}}{T_{m,avg} + 460}\right) = 17.64 \frac{954.091}{1.166}\left(\frac{29.12 + \frac{2.0}{13.6}}{78 + 460}\right) = 785.9$$

$$\text{or} \quad Vm_{stack} = \left(\frac{Vm}{\alpha} + Vw_{std}\right)\left(\frac{T_{s,avg} + 460}{T_{m,avg} + 460}\right)\left(\frac{P_m}{P_s}\right) \quad \text{(acf at stack conditions)}$$

=

2. Stack gas moisture condensed at standard conditions (scf)

$$Vw_{std} = 0.04707\ Vl_c$$

$$= 0.04707\,(679.9) = 32.003$$

3. Stack gas proportion of water vapor, by volume

$$B_{wo} = \frac{Vw_{std}}{Vw_{std} + Vm_{std}}$$

$$= \frac{32.003}{32.003 + 785.9} = 0.039$$

4. Stack gas dry molecular weight (lb/lb-mole)

$$MW_d = 0.44\ (\%CO_2) + 0.32\ (\%O_2) + 0.28\ (\%N_2 + \%CO)$$

$$= 0.44\,(4.95) + 0.32\,(14.27) + 0.28\,(80.78) = 29.362$$

5. Stack gas molecular weight (lb/lb-mole)

$$MW_s = MW_d\ (1 - B_{wo}) + 18\ (B_{wo})$$

$$= 28.92$$

6. Pressure stack, in. Hg

$$P_s = P_b + \frac{P_{st}}{13.6}$$

$$= 29.415$$

7. Stack gas velocity at stack conditions (ft/sec)

$$V_s = 85.49\,(C_p)\,(\sqrt{\Delta P})_{avg}\sqrt{\frac{T_{s,avg} + 460}{P_s\,MW_s}}$$

$$= 85.49\,(0.84)(2.43)\sqrt{\frac{610 + 460}{(29.415)(28.92)}} = 195.71$$

8. Stack gas volume at standard conditions (scfm)

$$Q_s = 60\,(1 - B_{wo})\,Vs_{avg}\,A_s\left(\frac{528}{T_{s,avg} + 460}\right)\left(\frac{P_s}{29.92}\right) = 60(1-0.039)(195.71)(1.2843)\left(\frac{528}{1070}\right)\left(\frac{2}{2.}\right.$$

$$= 7059.28$$

or $Q_a = 60\,Vs_{avg}\,A_s$ (acfm) =

9. Test percent isokinetic

$$\%I = \frac{17.33\,(T_{s,avg} + 460)\,[0.04707\,(W_{lc}) + Vm_{std}]}{\theta\,V_s\,P_s\,D_n^2}$$

$$= 80.7\,\%$$

10. Particulate matter concentration, gr/scf

$$C_s = 15.432\,\frac{M_p}{Vm_{std}} = \frac{15.432}{786.9}\,M_p = 0.0196\,(M_p)$$

M_p = grams

or $C_a = 15.432\,\dfrac{M_p}{Vm_{stack}}$ (gr/acf) =

11. Emission rate of particulate matter, lb/hr

$$ER = 0.00857\,(Q_s)\,C_s$$

$$= 0.00857\,(7058.28)(0.0196)\,M_p = 1.18627\,(M_p)$$

12. Percent excess air at sampling point

$$\%\,EA = \frac{100\,[\%O_2 - 0.5\,(\%CO)]}{0.264\ \%N_2 - (\%O_2 - 0.5 \times \%CO)}$$

	Probe + 10μ	3μ	1μ	filter	
Catch (M_p) grams	0.4218	0.0152	<0.0001	0.7903	1
ER lb/hr.	0.5004	0.0180	< 0.0012	0.9399	1
ER g/bhp-h.	0.1081	0.0039	< 0.0003	0.0031	c

13. Emission rate of particulate matter, lb/10⁶ Btu

$$E = 2.679 \times 10^4\left(\frac{M_p}{Vm_{std}}\right)F\left(\frac{20.9}{20.9 - \%O_2}\right)$$

=

METHOD 5 - BASELINE - DIESEL

ACUREX Corporation

PARTICULATE CALCULATIONS

1. Volume of dry gas sampled at standard conditions, 68° F, 29.92 inch Hg (scf)

$$Vm_{std} \quad 17.64\ \frac{Vm}{\alpha}\left(\frac{P_b + \frac{\Delta H}{13.6}}{T_{m,avg} + 460}\right) = 17.64\ \frac{176.119}{0.999}\left(\frac{28.8 + \frac{3.83}{13.6}}{93.5 + 460}\right) = 181.95$$

$$\text{or}\quad Vm_{stack} = \left(\frac{Vm}{\alpha} + Vw_{std}\right)\left(\frac{T_{s,avg} + 460}{T_{m,avg} + 460}\right)\left(\frac{P_m}{P_s}\right) \quad \text{(acf at stack conditions)}$$

$$=$$

2. Stack gas moisture condensed at standard conditions (scf)

$$Vw_{std} = 0.04707\ Vl_c$$

$$= 0.04707\ (200.5) = 9.4375$$

3. Stack gas proportion of water vapor, by volume

$$B_{wo} = \frac{Vw_{std}}{Vw_{std} + Vm_{std}}$$

$$= \frac{9.4375}{9.4375 + 181.95} = 0.05$$

4. Stack gas dry molecular weight (lb/lb-mole)

$$MW_d = 0.44\ (\%CO_2) + 0.32\ (\%O_2) + 0.28\ (\%N_2 + \%CO)$$

$$= 0.44(5.3) + 0.32(13.7) + 0.28(81) = 29.376$$

5. Stack gas molecular weight (lb/lb-mole)

$$MW_s = MW_d\ (1 - B_{wo}) + 18\ (B_{wo})$$

$$= 29.376(1 - 0.05) + 18(0.05) = 28.83$$

6. Pressure stack, in. Hg

$$P_s = P_b + \frac{P_{st}}{13.6}$$

$$= 28.8 + \frac{3}{13.6} = 29.02$$

7. Stack gas velocity at stack conditions (ft/sec)

$$V_s = 85.49\ (C_p)\ (\sqrt{\Delta P})_{avg} \sqrt{\frac{T_{s,avg} + 460}{P_s\ MW_s}}$$

$$= 85.49(0.841)(2.47)\sqrt{\frac{623+460}{29.02(28.83)}} = 202.05$$

8. Stack gas volume at standard conditions (scfm)

$$Q_s = 60\ (1 - B_{wo})\ Vs_{avg}\ A_s \left(\frac{528}{T_{s,avg} + 460}\right)\left(\frac{P_s}{29.92}\right) = 60(1-0.05)(202.05)(1.0893)\left(\frac{528}{1083}\right)\frac{29.0}{29.9}$$

$$\text{or}\quad Q_a = 60\ Vs_{avg}\ A_s\ (\text{acfm}) = \qquad = 7021.43$$

9. Test percent isokinetic

$$\%I = \frac{17.33\ (T_{s,avg} + 460)\ \ [0.04707\ (W_{lc}) + Vm_{std}]}{\theta\ V_s\ P_s\ D_n^2}$$

$$= \frac{17.33(1083)[0.04707(200.5)+181.95]}{(183)(202.05)(29.02)(.185)^2} = 99.44\ \%$$

10. Particulate matter concentration, gr/scf

$$C_s = 15.432\frac{M_p}{Vm_{std}} = \qquad \frac{15.432}{181.95}M_p = 0.0848\ M_p$$

$$\text{or}\quad C_a = 15.432\frac{M_p}{Vm_{stack}}\ (\text{gr/acf}) =$$

11. Emission rate of particulate matter, lb/hr

$$ER = 0.00857\ (Q_s)\ C_s$$

$$= 0.00857(7021.43)(0.0848)M_p = \qquad 5.1036\ M_p$$

12. Percent excess air at sampling point

$$\%\ EA = \frac{100\ [\%O_2 - 0.5\ (\%CO)]}{0.264\ \ \%N_2 - (\%O_2 - 0.5 \times \%CO)} =$$

	probe, filter	Condens
Mp grams	0.1979	0.022
lb/hr	1.0100	0.113
g/Bhp-h.	0.2184	0.024

13. Emission rate of particulate matter, lb/10⁶ Btu

$$E = 2.679 \times 10^{4}\left(\frac{M_p}{Vm_{std}}\right)F\left(\frac{20.9}{20.9 - \%O_2}\right)$$

=

METHOD 5- CONTROLLED NOx - DIESEL

ACUREX
Corporation

PARTICULATE CALCULATIONS

1. Volume of dry gas sampled at standard conditions, 68° F, 29.92 inch Hg (scf)

$$Vm_{std} = 17.64\ \frac{Vm}{\alpha}\left(\frac{P_b + \frac{\Delta H}{13.6}}{T_{m,avg} + 460}\right) = 17.64\ \frac{203.676}{0.999}\left(\frac{29.4 + \frac{4.56}{13.6}}{68 + 460}\right) = 207.51$$

$$\text{or}\quad Vm_{stack} = \left(\frac{Vm}{\alpha} + Vw_{std}\right)\left(\frac{T_{s,avg} + 460}{T_{m,avg} + 460}\right)\left(\frac{P_m}{P_s}\right) \quad \text{(acf at stack conditions)}$$

$$=$$

2. Stack gas moisture condensed at standard conditions (scf)

$$Vw_{std} = 0.04707\ Vl_c$$

$$= 0.04707\,(244.8) = 11.52$$

3. Stack gas proportion of water vapor, by volume

$$B_{wo} = \frac{Vw_{std}}{Vw_{std} + Vm_{std}}$$

$$= \frac{11.52}{11.52 + 207.51} = 0.05$$

4. Stack gas dry molecular weight (lb/lb-mole)

$$MW_d = 0.44\ (\%CO_2) + 0.32\ (\%O_2) + 0.28\ (\%N_2 + \%CO)$$

$$= 0.44\,(4.95) + 0.32\,(14.27) + 0.28\,(80.78) = 29.363$$

5. Stack gas molecular weight (lb/lb-mole)

$$MW_s = MW_d\ (1 - B_{wo}) + 18\ (B_{wo})$$

$$= 29.363(1 - 0.05) + 18\,(0.05) = 28.79$$

6. Pressure stack, in. Hg

$$P_s = P_b + \frac{P_{st}}{13.6}$$

$$= 29.4 + \frac{3.2}{13.6} = 29.64$$

7. Stack gas velocity at stack conditions (ft/sec)

$$V_s = 85.49\,(C_p)\,(\sqrt{\Delta P})_{avg}\sqrt{\frac{T_{s,avg} + 460}{P_s\,MW_s}}$$

$$= 85.49\,(0.841)(2.73)\sqrt{\frac{609 + 460}{(29.64)28.79}} = 219.69$$

8. Stack gas volume at standard conditions (scfm)

$$Q_s = 60\,(1 - B_{wo})\,Vs_{avg}\,A_s\left(\frac{528}{T_{s,avg} + 460}\right)\left(\frac{P_s}{29.92}\right) =$$

$$\text{or } Q_a = 60\,Vs_{avg}\,A_s\text{ (acfm)} = 60(1-0.05)(219.69)(1.2893)\left(\frac{528}{1069}\right)\frac{29.64}{29.92} = 7899.7$$

9. Test percent isokinetic

$$\%I = \frac{17.33\,(T_{s,avg} + 460)\,[0.04707\,(W_{lc}) + Vm_{std}]}{\theta\,V_s\,P_s\,D_n^2}$$

$$= \frac{17.33\,(1069)\,[11.52 + 207.51]}{180(219.69)(29.64)(0.185)^2} = 101\%$$

10. Particulate matter concentration, gr/scf

$$C_s = 15.432\,\frac{M_p}{Vm_{std}} = \frac{15.432}{207.51}\,M_p = 0.0744\,M_p$$

$$\text{or } C_a = 15.432\,\frac{M_p}{Vm_{stack}}\text{ (gr/acf)} =$$

11. Emission rate of particulate matter, lb/hr

$$ER = 0.00857\,(Q_s)\,C_s$$

$$= 0.00857(7899.7)(0.0744)M_p = 5.0369$$

	Probe + filter	condensible	+
Mp grams	0.2563	—	
ER lb/hr	1.2910	–	
g/Bhp-h.	0.2790	–	

12. Percent excess air at sampling point

$$\%\,EA = \frac{100\,[\%O_2 - 0.5\,(\%CO)]}{0.264\ \%N_2 - (\%O_2 - 0.5 \times \%CO)} =$$

13. Emission rate of particulate matter, lb/10^6 Btu

$$E = 2.679 \times 10^{4}\left(\frac{M_p}{Vm_{std}}\right)F\left(\frac{20.9}{20.9 - \%O_2}\right)$$

=

5.3 SULFUR EMISSIONS DATA REDUCTION

H_2SO_4 Mist and SO_2
Clean-Up and Analysis

Plant Colt Ind - Beloit

Date 6-24-80

Project No. CMEA

Recorded by Gregg Nicholl

BASELINE DIESEL

H_2SO_4 Mist and SO_2 Train Description and Recovery Data

Impinger Sequence	1	2	3	4	5	6
Impinger Number						
G-S Standard ( )	✓		✓			
G-S Modified ( )		✓		✓		
Contents	IPA	H_2O_2	H_2O_2	SiO_2		
Concentration (%)	80%	3%	3%			
Initial Volume (ml)						
Final Volume (ml)						
Dilution Volume (ml)	400	325				
Container Number	062	061A	061B			

Location of glass wool in train Filter between probe + 1st IPA impinger

Location and type of filter in train Glass Fiber Filter between Impinger 1 & 2

Total Condensate (No. 8-7) ______

$$C_{SO_2} = \frac{7.05\times10^{-5}(42.03-0.14)(0.0143)\left(\frac{325}{25}\right)}{159.26} = 3.57\times10^{-6}\ \text{lb/ft}^3\ \text{dry}$$

H_2O_2 Sample Blank No. Yes

$$C_{H_2SO_4} = \frac{1.08\times10^{-4}(2.95-0.08)(0.011)\left(\frac{400}{10}\right)}{159.26} = 8.56\times10^{-7}\ \text{lb/ft}^3\ \text{dry}$$

IPA Sample Blank No. Yes

H_2SO_4 and SO_2 Analysis

Sample Number	062	062 ·	061A&B			
Volume of Titrant for Sample (ml)	3.0	2.9	42.03			
Volume of Titrant for Blank (ml)	0.08	0.08	0.14			
Normality of Titrant	0.011	0.011	0.0143			
Ttl. Vol. of Soln. (ml)	400	400	325			
Volume of Sample Aliquot Titrated (ml)	10	10	25			
Performed by	Gregg	Gregg	Gregg			

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H_2SO_4 Mist and SO_2 Clean-Up and Analysis

Plant *Colt Ind. - Beloit*

Project No. *CMEA*

Date *6-23-80*

Recorded by *Greg Nicholl*

CONTROLLED NOx TEST - DIESEL

H_2SO_4 Mist and SO_2 Train Description and Recovery Data

Impinger Sequence	1	2	3	4	5	6
Impinger Number						
G-S Standard ( )	✓		✓			
G-S Modified ( )		✓		✓		
Contents	IPA	H_2O_2	H_2O_2	SiO_2		
Concentration (%)	80%	3%	3%			
Initial Volume (ml)						
Final Volume (ml)						
Dilution Volume (ml)		1027				
Container Number	057	058A&B	058B&A			

Location of glass wool in train *Filter between probe and 1st IPA Impinger*

Location and type of filter in train *Glass fiber filter between impingers 1&2*

Total Condensate
(No. 8-7) ____________

$$C_{SO_2} = \frac{7.05\times10^{-5}(22.23-0.14)(0.0148)\left(\frac{1027}{25}\right)}{133.82} = 7.07\times10^{-6}\ \text{lb/ft}^3$$

H_2O_2 Sample Blank No. *Yes*

IPA Sample Blank No. *Yes*

$$C_{H_2SO_4} = \frac{1.08\times10^{-4}(3.9-0.08)(0.011)\left(\frac{409}{10}\right)}{133.82} = 1.37\times10^{-6}\ \text{lb/ft}^3$$

H_2SO_4 and SO_2 Analysis

Sample Number	057	057	058A&B			
Volume of Titrant for Sample (ml)	4.0	3.8	22.23			
Volume of Titrant for Blank (ml)	0.08	0.08	0.14			
Normality of Titrant	0.011	0.011	0.0148			
Ttl. Vol. of Soln. (ml)	409	409	1027			
Volume of Sample Aliquot Titrated (ml)	10	10	25			
Performed by	Greg	Greg	Greg			

5.4 TRACE ELEMENTS

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-8434
Reply to INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE GOLDEN, COLORADO 80401, PHONE 303-278-9521

To: Mr. Brent Higginbotham
Acurex Corporation
485 Clyde Ave.
Mountain View, CA 94042

Date September 23, 1980

Analyst T. Bouts

P. O. No.:

Sample No.: 80-1535

XAD - BLANK

IAD No 97-E697-116-28

SPARK SOURCE MASS SPECTROGRAPHIC ANALYSIS
CONCENTRATION IN PPM WEIGHT

ELEMENT	CONC	ELEMENT	CONC	ELEMENT	CONC	ELEMENT	CONC
Uranium		Terbium		Ruthenium		Vanadium	0.3
Thorium		Gadolinium		Molybdenum	0.4	Titanium	2
Bismuth	<0.1	Europium		Niobium		Scandium	<0.1
Lead	0.6	Samarium		Zirconium	1	Calcium	170
Thallium		Neodymium		Yttrium	<0.1	Potassium	24
Mercury	NR	Praseodymium	0.2	Strontium	0.2	Chlorine	1
Gold		Cerium	0.9	Rubidium	<0.1	Sulfur	9
Platinum		Lanthanum	2	Bromine	0.4	Phosphorus	26
Iridium		Barium	1	Selenium	0.2	Silicon	*MC
Osmium		Cesium		Arsenic	<0.1	Aluminum	13
Rhenium		Iodine	<0.1	Germanium	0.2	Magnesium	17
Tungsten		Tellurium		Gallium	0.1	Sodium	98
Tantalum	≤0.6	Antimony	0.2	Zinc	6	Fluorine	≈3
Hafnium		Tin	0.1	Copper	13	Oxygen	NR
Lutetium		Indium	STD	Nickel	MC	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	3	Carbon	NR
Thulium		Silver		Iron	120	Boron	<0.1
Erbium		Palladium		Manganese	39	Beryllium	
Holmium		Rhodium		Chromium	29	Lithium	0.1
Dysprosium						Hydrogen	NR

* Heterogeneous

STD — Internal Standard
NR — Not Reported
All elements not detected < 0.1 ppm
MC — Major Component
INT — Interference

Approved:
5-19

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-8434
Reply to INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE 303-278-9521

To: Mr. Brent Higginbotham
Acurex Corporation
485 Clyde Ave.
Mountain View, CA 94042

Date: September 22, 1980

Analyst: L. Jacobs

P. O. No.:

Sample No.: 80-1544
First Impinger Blank

IAD No. 97-E697-116-28

SPARK SOURCE MASS SPECTROGRAPHIC ANALYSIS
CONCENTRATION IN µg/ml

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	0.001
Thorium		Gadolinium		Molybdenum	0.01	Titanium	0.09
Bismuth		Europium		Niobium		Scandium	
Lead	0.07	Samarium		Zirconium		Calcium	2
Thallium		Neodymium		Yttrium		Potassium	0.5
Mercury	NR	Praseodymium		Strontium		Chlorine	0.1
Gold		Cerium		Rubidium	<0.001	Sulfur	0.2
Platinum		Lanthanum		Bromine	0.003	Phosphorus	0.9
Iridium		Barium	0.04	Selenium		Silicon	2
Osmium		Cesium		Arsenic		Aluminum	MC
Rhenium		Iodine		Germanium		Magnesium	*0.9
Tungsten		Tellurium		Gallium		Sodium	0.5
Tantalium		Antimony		Zinc	0.03	Fluorine	
Hafnium		Tin		Copper	<0.001	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.03	Nitrogen	NR
Ytterbium		Cadmium	≤0.01	Cobalt	0.007	Carbon	NR
Thulium		Silver		Iron	1	Boron	<0.001
Erbium		Palladium		Manganese	0.02	Beryllium	<0.001
Holmium		Rhodium		Chromium	0.001	Lithium	<0.001
Dysprosium						Hydrogen	NR

* Heterogeneous

STD — Internal Standard
NR — Not Reported
All elements not detected < 0.002 µg/ml
MC — Major Component >10 µg/ml
INT — Interference

Approved: M Jacobs
5-20

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-8434
Reply to INSTRUMENTAL ANALYSIS DIVISION 14335 WEST 44TH AVENUE GOLDEN, COLORADO 80401 PHONE 303-278-9521

To: Mr. Brent Higginbotham
Acurex Corporation
485 Clyde Ave.
Mountain View, CA 94042

Date September 25, 1980

Analyst T. Bouts

P. O. No.:

Sample No.: A-45 Blank

IAD No. 97-E697-116-28

FILTER BLANK

SPARK SOURCE MASS SPECTROGRAPHIC ANALYSIS

CONCENTRATION IN μg/cm²

ELEMENT	CONC	ELEMENT	CONC	ELEMENT	CONC	ELEMENT	CONC
Uranium	≤0.008	Terbium		Ruthenium		Vanadium	0.02
Thorium	0.01	Gadolinium		Molybdenum	0.005	Titanium	0.9
Bismuth		Europium		Niobium	0.01	Scandium	0.002
Lead	0.007	Samarium		Zirconium	0.05	Calcium	MC
Thallium		Neodymium	0.004	Yttrium	0.003	Potassium	0.5
Mercury	NR	Praseodymium	0.003	Strontium	0.04	Chlorine	0.4
Gold	<0.001	Cerium	0.01	Rubidium	<0.001	Sulfur	0.8
Platinum		Lanthanum	0.02	Bromine	0.03	Phosphorus	0.07
Iridium		Barium	0.2	Selenium	0.005	Silicon	MC
Osmium		Cesium		Arsenic	0.001	Aluminum	MC
Rhenium		Iodine	0.001	Germanium		Magnesium	1
Tungsten	0.01	Tellurium		Gallium	0.008	Sodium	>2
Tantalum		Antimony		Zinc	0.01	Fluorine	≈0.005
Hafnium		Tin		Copper	0.01	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.01	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	<0.001	Carbon	NR
Thulium		Silver	0.001	Iron	0.2	Boron	0.9
Erbium		Palladium		Manganese	0.003	Beryllium	
Holmium		Rhodium		Chromium	0.02	Lithium	<0.001
Dysprosium						Hydrogen	NR

STD — Internal Standard
NR — Not Reported
All elements not detected <0.001 μg/cm²
MC — Major Component > 10 μg/cm²
INT — Interference

Approved: M Jacobs

5-21

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-8434
Reply to INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE 303 278-9521

To: Mr. Brent Higginbotham
Acurex Corporation
485 Clyde Avenue
Mountain View, California 94042

Date September 26, 1980

Analyst T. Bouts

P. O. No.:

Sample No.: 1508

DIESEL ENGINE -
[illegible] FILTER

SPARK SOURCE MASS SPECTROGRAPHIC ANALYSIS

IAD No 97-E697-116-28

CONCENTRATION IN µg/cm²

ELEMENT	CONC	ELEMENT	CONC	ELEMENT	CONC	ELEMENT	CONC
Uranium		Terbium		Ruthenium		Vanadium	0.01
Thorium	0.005	Gadolinium		Molybdenum	0.009	Titanium	0.8
Bismuth	<0.001	Europium		Niobium	0.004	Scandium	0.002
Lead	0.1	Samarium	0.001	Zirconium	0.08	Calcium	MC
Thallium		Neodymium	0.002	Yttrium	0.002	Potassium	0.4
Mercury	NR	Praseodymium	0.002	Strontium	0.04	Chlorine	0.1
Gold		Cerium	0.006	Rubidium	<0.001	Sulfur	MC
Platinum		Lanthanum	0.008	Bromine	0.03	Phosphorus	0.2
Iridium		Barium	0.1	Selenium	0.004	Silicon	MC
Osmium		Cesium	<0.001	Arsenic	0.002	Aluminum	MC
Rhenium		Iodine	0.003	Germanium	<0.001	Magnesium	3
Tungsten	0.003	Tellurium	0.005	Gallium	0.006	Sodium	MC
Tantalum		Antimony		Zinc	0.1	Fluorine	≈0.4
Hafnium		Tin	0.006	Copper	0.09	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.02	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	<0.001	Carbon	NR
Thulium		Silver	<0.001	Iron	0.5	Boron	2
Erbium		Palladium		Manganese	0.007	Beryllium	<0.001
Holmium		Rhodium		Chromium	0.03	Lithium	0.009
Dysprosium						Hydrogen	NR

STD — Internal Standard
NR — Not Reported
All elements not detected < 0.001 µg/cm²
MC — Major Component >10µg/cm²
INT — Interference

Approved
5-22

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES 228 NORTH LA SALLE STREET, CHICAGO ILLINOIS 60601 · AREA CODE 312 726-8434
Reply to INSTRUMENTAL ANALYSIS DIVISION 14335 WEST 44TH AVENUE GOLDEN, COLORADO 80401 PHONE 303 278-9521

To: Mr. Brent Higginbotham
Acurex Corporation
485 Clyde Ave.
Mountain View, CA 94042

Date September 25, 1980

Analyst T. Bouts

P. O. No.:

Sample No.: 80-1516

Diesel Engine -
Low NOx Filter

IAD No. 97-E697-116-28

SPARK SOURCE MASS SPECTROGRAPHIC ANALYSIS
CONCENTRATION IN $\mu g/cm^2$

ELEMENT	CONC	ELEMENT	CONC	ELEMENT	CONC	ELEMENT	CONC
Uranium	≤0.002	Terbium		Ruthenium		Vanadium	0.007
Thorium	0.004	Gadolinium		Molybdenum	0.009	Titanium	0.3
Bismuth	<0.001	Europium		Niobium	0.004	Scandium	<0.001
Lead	0.09	Samarium	0.001	Zirconium	0.06	Calcium	MC
Thallium		Neodymium	0.001	Yttrium	0.002	Potassium	0.8
Mercury	NR	Praseodymium	<0.001	Strontium	0.08	Chlorine	0.06
Gold		Cerium	0.006	Rubidium	<0.001	Sulfur	2
Platinum		Lanthanum	0.01	Bromine	0.02	Phosphorus	0.09
Iridium		Barium	0.2	Selenium	0.001	Silicon	6
Osmium		Cesium		Arsenic	0.002	Aluminum	MC
Rhenium		Iodine	0.002	Germanium	<0.001	Magnesium	0.5
Tungsten		Tellurium		Gallium	0.003	Sodium	>0.06
Tantalum		Antimony	<0.001	Zinc	0.07	Fluorine	INT
Hafnium		Tin	0.002	Copper	0.04	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.01	Nitrogen	NR
Ytterbium		Cadmium	<0.001	Cobalt	<0.001	Carbon	NR
Thulium		Silver	<0.001	Iron	0.2	Boron	INT
Erbium		Palladium		Manganese	0.006	Beryllium	INT
Holmium		Rhodium		Chromium	0.02	Lithium	INT
Dysprosium						Hydrogen	NR

STD — Internal Standard
NR — Not Reported
All elements not detected $<0.001\ \mu g/cm^2$
MC — Major Component $>10\ \mu g/cm^2$
INT — Interference

Approved
5-23

M. Jacobs

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-8434
Reply to INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE 303-278-9521

To: Mr. Brent Higginbotham
Acurex Corporation
485 Clyde Ave.
Mountain View, CA 94042

Date September 22, 1980

Analyst C. Wilson

P. O. No.:

Sample No.: 80-1556

Diesel [illegible]
Fuel Oil

IAD No. 97-E697-116-28

SPARK SOURCE MASS SPECTROGRAPHIC ANALYSIS
CONCENTRATION IN PPM WEIGHT

ELEMENT	CONC	ELEMENT	CONC	ELEMENT	CONC	ELEMENT	CONC
Uranium		Terbium		Ruthenium		Vanadium	0.04
Thorium		Gadolinium		Molybdenum	2	Titanium	2
Bismuth		Europium		Niobium		Scandium	0.02
Lead	0.2	Samarium		Zirconium	0.09	Calcium	51
Thallium		Neodymium		Yttrium		Potassium	44
Mercury		Praseodymium		Strontium	0.1	Chlorine	0.7
Gold		Cerium		Rubidium		Sulfur	MC
Platinum		Lanthanum		Bromine	0.4	Phosphorus	7
Iridium		Barium	0.8	Selenium		Silicon	*15
Osmium		Cesium		Arsenic		Aluminum	>21
Rhenium		Iodine	≤0.03	Germanium		Magnesium	2
Tungsten	≤0.1	Tellurium		Gallium		Sodium	1
Tantalium		Antimony		Zinc	0.9	Fluorine	=0.2
Hafnium		Tin		Copper	0.6	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.7	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	0.08	Carbon	NR
Thulium		Silver		Iron	10	Boron	0.02
Erbium		Palladium		Manganese	*0.2	Beryllium	
Holmium		Rhodium		Chromium	0.05	Lithium	0.06
Dysprosium						Hydrogen	NR

* Heterogeneous

STD — Internal Standard
NR — Not Reported
All elements not detected < 0.02 ppm
MC — Major Component > 100 ppm
INT — Interference

Approved
5-24

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-8434
Reply to INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE 303-278-9521

To: Mr. Brent Higginbotham
Acurex Corporation
485 Clyde Ave.
Mountain View, CA 94042

Date September 22, 1980

Analyst C. Wilson

P. O. No.:

Sample No.: 80-1558
DIESEL CONTROLLED
FUEL OIL

IAD No 97-E697-116-28

SPARK SOURCE MASS SPECTROGRAPHIC ANALYSIS
CONCENTRATION IN PPM WEIGHT

ELEMENT	CONC	ELEMENT	CONC	ELEMENT	CONC	ELEMENT	CONC
Uranium		Terbium		Ruthenium		Vanadium	0.02
Thorium		Gadolinium		Molybdenum	0.2	Titanium	2
Bismuth		Europium		Niobium		Scandium	<0.01
Lead	0.3	Samarium		Zirconium		Calcium	19
Thallium		Neodymium		Yttrium		Potassium	58
Mercury		Praseodymium		Strontium	0.2	Chlorine	0.3
Gold		Cerium	0.02	Rubidium	0.01	Sulfur	1
Platinum		Lanthanum	0.02	Bromine	0.08	Phosphorus	0.5
Iridium		Barium	0.3	Selenium		Silicon	5
Osmium		Cesium		Arsenic		Aluminum	5
Rhenium		Iodine		Germanium		Magnesium	1
Tungsten		Tellurium		Gallium		Sodium	4
Tantalium		Antimony	0.07	Zinc	0.6	Fluorine	=3
Hafnium		Tin		Copper	0.2	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.4	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	0.04	Carbon	NR
Thulium		Silver	0.2	Iron	0.04	Boron	<0.01
Erbium		Palladium		Manganese	0.05	Beryllium	
Holmium		Rhodium		Chromium	0.1	Lithium	0.04
Dysprosium						Hydrogen	NR

STD — Internal Standard
NR — Not Reported
All elements not detected <0.01 ppm
MC — Major Component >100 ppm
INT — Interference

Approved: M Sparks
5-25

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-8434
Reply to INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE 303-278-9521

To: Mr. Brent Higginbotham
Acurex Corporation
485 Clyde Ave.
Mountain View, CA 94042

Date September 22, 1980

Analyst L. Jacobs

P. O. No.:

Sample No.: 80-1560

IAD No 97-E697-116-28

DIESEL
LUBE OIL

SPARK SOURCE MASS SPECTROGRAPHIC ANALYSIS
CONCENTRATION IN PPM WEIGHT

ELEMENT	CONC.	ELEMENT	CONC	ELEMENT	CONC	ELEMENT	CONC
Uranium		Terbium		Ruthenium		Vanadium	0.04
Thorium		Gadolinium		Molybdenum	0.4	Titanium	7
Bismuth		Europium		Niobium		Scandium	≤0.02
Lead	1	Samarium		Zirconium		Calcium	MC
Thallium		Neodymium		Yttrium		Potassium	MC
Mercury		Praseodymium		Strontium	23	Chlorine	53
Gold		Cerium		Rubidium	0.04	Sulfur	MC
Platinum		Lanthanum	0.03	Bromine	0.7	Phosphorus	6
Iridium		Barium	50	Selenium	0.3	Silicon	96
Osmium		Cesium	0.01	Arsenic	1	Aluminum	0.7
Rhenium		Iodine		Germanium		Magnesium	3
Tungsten		Tellurium		Gallium	0.05	Sodium	MC
Tantalium		Antimony	0.02	Zinc	18	Fluorine	=0.2
Hafnium		Tin	0.2	Copper	5	Oxygen	NR
Lutetium		Indium	STD	Nickel	2	Nitrogen	NR
Ytterbium		Cadmium	0.07	Cobalt	0.7	Carbon	NR
Thulium		Silver	0.01	Iron	85	Boron	<0.01
Erbium		Palladium		Manganese	0.5	Beryllium	<0.01
Holmium		Rhodium		Chromium	7	Lithium	0.07
Dysprosium						Hydrogen	NR

STD — Internal Standard
NR — Not Reported
All elements not detected < 0.01 ppm
MC — Major Component > 100 ppm
INT — Interference

Approved: M Jacobs
5-26

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-8434
Reply to INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE 303-278-9521

To: Mr. Brent Higginbotham
Acurex Corporation
485 Clyde Ave.
Mountain View, CA 94042

Date September 23, 1980

Analyst T. Bouts

P. O. No.:

Sample No.: 80-1533

IAD No. 97-E697-116-28

[illegible] BASELINE
XAD

SPARK SOURCE MASS SPECTROGRAPHIC ANALYSIS
CONCENTRATION IN PPM WEIGHT

ELEMENT	CONC	ELEMENT	CONC	ELEMENT	CONC	ELEMENT	CONC
Uranium		Terbium		Ruthenium		Vanadium	<0.1
Thorium		Gadolinium		Molybdenum	*0.3	Titanium	1
Bismuth		Europium		Niobium		Scandium	<0.1
Lead	0.3	Samarium		Zirconium	0.3	Calcium	130
Thallium		Neodymium		Yttrium		Potassium	MC
Mercury	NR	Praseodymium	<0.1	Strontium	0.4	Chlorine	0.9
Gold		Cerium	0.5	Rubidium	<0.1	Sulfur	48
Platinum		Lanthanum	0.6	Bromine	0.9	Phosphorus	9
Iridium		Barium	1	Selenium	<0.1	Silicon	270
Osmium		Cesium		Arsenic	<0.1	Aluminum	MC
Rhenium		Iodine		Germanium	<0.1	Magnesium	9
Tungsten		Tellurium		Gallium	<0.1	Sodium	>59
Tantalum	≤0.4	Antimony		Zinc	5	Fluorine	≈2
Hafnium		Tin	<0.1	Copper	21	Oxygen	NR
Lutetium		Indium	STD	Nickel	MC	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	2	Carbon	NR
Thulium		Silver	0.3	Iron	110	Boron	*<0.1
Erbium		Palladium		Manganese	3	Beryllium	
Holmium		Rhodium		Chromium	13	Lithium	<0.1
Dysprosium						Hydrogen	NR

* Heterogeneous

STD — Internal Standard
NR — Not Reported
All elements not detected <0.1 ppm
MC — Major Component
INT — Interference

Approved: M Jacobs
5-27

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-8434
Reply to INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE 303-278-9521

To: Mr. Brent Higginbotham
Acurex Corporation
485 Clyde Ave.
Mountain View, CA 94042

Date September 23, 1980

Analyst T. Bouts

P. O. No.:

Sample No.: 80-1534
DIESEL CONTROLLED
XAD

IAD No. 97-E697-116-28

SPARK SOURCE MASS SPECTROGRAPHIC ANALYSIS
CONCENTRATION IN PPM WEIGHT

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC
Uranium		Terbium		Ruthenium		Vanadium	0.2
Thorium		Gadolinium		Molybdenum	0.9	Titanium	2
Bismuth		Europium		Niobium		Scandium	<0.1
Lead	2	Samarium		Zirconium	0.4	Calcium	130
Thallium		Neodymium		Yttrium		Potassium	36
Mercury	NR	Praseodymium	0.2	Strontium	0.4	Chlorine	1
Gold		Cerium	0.7	Rubidium	<0.1	Sulfur	22
Platinum		Lanthanum	1	Bromine	0.4	Phosphorus	34
Iridium		Barium	4	Selenium	≤0.2	Silicon	200
Osmium		Cesium		Arsenic	<0.1	Aluminum	15
Rhenium		Iodine		Germanium	<0.1	Magnesium	9
Tungsten		Tellurium		Gallium	0.2	Sodium	25
Tantalum	≤1	Antimony		Zinc	17	Fluorine	
Hafnium		Tin		Copper	35	Oxygen	NR
Lutetium		Indium	STD	Nickel	MC	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	4	Carbon	NR
Thulium		Silver	<0.1	Iron	310	Boron	0.2
Erbium		Palladium		Manganese	30	Beryllium	
Holmium		Rhodium		Chromium	30	Lithium	0.3
Dysprosium						Hydrogen	NR

STD — Internal Standard
NR — Not Reported
All elements not detected < 0.1 ppm
MC — Major Component
INT — Interference

Approved: M Jacobs
5-28

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-8434
Reply to INSTRUMENTAL ANALYSIS DIVISION 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE 303-278-9521

To: Mr. Brent Higginbotham
Acurex Corporation
485 Clyde Ave.
Mountain View, CA 94042

Date September 22, 1980

Analyst L. Jacobs

P. O. No.:

Sample No.: 80-1545

IAD No. 97-E697-116-28

Diesel [illegible]
1st [illegible] & [illegible]

SPARK SOURCE MASS SPECTROGRAPHIC ANALYSIS
CONCENTRATION IN µg/ml

ELEMENT	CONC	ELEMENT	CONC	ELEMENT	CONC	ELEMENT	CONC
Uranium		Terbium		Ruthenium		Vanadium	0.002
Thorium		Gadolinium		Molybdenum	0.02	Titanium	0.4
Bismuth		Europium		Niobium	<0.001	Scandium	0.1
Lead	0.03	Samarium		Zirconium	0.009	Calcium	10
Thallium		Neodymium	0.003	Yttrium	<0.001	Potassium	MC
Mercury	NR	Praseodymium		Strontium	0.002	Chlorine	0.2
Gold		Cerium	0.001	Rubidium	0.01	Sulfur	MC
Platinum		Lanthanum	0.003	Bromine	0.01	Phosphorus	MC
Iridium		Barium	0.05	Selenium	0.3	Silicon	6
Osmium		Cesium	<0.001	Arsenic	0.001	Aluminum	MC
Rhenium		Iodine		Germanium	<0.001	Magnesium	1
Tungsten		Tellurium		Gallium	0.005	Sodium	MC
Tantalium		Antimony	0.002	Zinc	1	Fluorine	≈0.009
Hafnium		Tin	0.07	Copper	0.2	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.2	Nitrogen	NR
Ytterbium		Cadmium	0.02	Cobalt	0.01	Carbon	NR
Thulium		Silver	0.1	Iron	4	Boron	0.005
Erbium		Palladium		Manganese	0.1	Beryllium	
Holmium		Rhodium		Chromium	0.03	Lithium	
Dysprosium						Hydrogen	NR

STD — Internal Standard
NR — Not Reported
All elements not detected <0.001 µg/ml
MC — Major Component >10 µg/ml
INT — Interference

Approved: M J Jacobs
5-29

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-8434
Reply to INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE 303-278-9521

To: Mr. Brent Higginbotham
Acurex Corporation
485 Clyde Ave.
Mountain View, CA 94042

Date September 22, 1980

Analyst L. Jacobs

P. O. No.:

Sample No.: 80-1546

IAD No. 97-E697-116-28

DIESEL CONTROLLED
[illegible] & ORGANIC MODULE COMPOSITE

SPARK SOURCE MASS SPECTROGRAPHIC ANALYSIS
CONCENTRATION IN μg/ml

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC
Uranium		Terbium		Ruthenium		Vanadium	0.002
Thorium		Gadolinium		Molybdenum	0.01	Titanium	0.1
Bismuth		Europium		Niobium	0.002	Scandium	≤0.002
Lead	0.05	Samarium		Zirconium	0.006	Calcium	2
Thallium		Neodymium		Yttrium	0.001	Potassium	MC
Mercury	NR	Praseodymium		Strontium	0.009	Chlorine	0.1
Gold		Cerium		Rubidium	0.001	Sulfur	MC
Platinum		Lanthanum		Bromine	0.02	Phosphorus	1
Iridium		Barium	0.05	Selenium	0.4	Silicon	11
Osmium		Cesium	<0.001	Arsenic	<0.001	Aluminum	MC
Rhenium		Iodine		Germanium	<0.001	Magnesium	0.4
Tungsten		Tellurium	0.002	Gallium	0.01	Sodium	MC
Tantalium		Antimony	0.007	Zinc	3	Fluorine	≈0.9
Hafnium		Tin	0.08	Copper	4	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.09	Nitrogen	NR
Ytterbium		Cadmium	0.006	Cobalt	0.02	Carbon	NR
Thulium		Silver	0.02	Iron	1	Boron	0.001
Erbium		Palladium		Manganese	0.04	Beryllium	
Holmium		Rhodium		Chromium	0.1	Lithium	0.004
Dysprosium						Hydrogen	NR

STD — Internal Standard
NR — Not Reported
All elements not detected < 0.001 μg/ml
MC — Major Component > 10 μg/ml
INT — Interference

Approved: M Jacobs
5-30

AAS ANALYSIS SHEET

Contractor Acurex

Sample Site COLT INDUSTRIES Sample Acquisition Date 4-22/23-80

Type of Source COMPRESSION IGNITION ENGINE

Test Number Sample ID Number

Sample Description

Original Sample Volume or Mass

Analyst Responsible G. Nicoll Date Analyzed 7-9-80 Time

Calculations and Report Reviewed By G. Nicoll Report Date

	As	Hg	Sb
Instrument Used	PE 460	PE 460	PE 460
Wavelength Setting (nm)	193.7	253.7	217.6
Lamp Current (ma)	8 watts	6	20
Fuel/Oxidizer Pressures (psi)			
PM Voltage (volts)			
Detection Limit ug/L	10	1	3
Sensitivity (abs. units/ppm/sample volume)			
High/Low Calibration Standards (ppm)	0.050	0.050	0.100
Sample Aliquot Volume (mL)	0.02	25.	0.02
Dilution Factor			
Uncorrected Sample Aliquot Value (ppm)			
Blank Value (ppm)			
Corrected Sample Aliquot Value (ppm)			
Assigned Concentration*			
At Source Mass/Volume, mg/m^3 or µg/L			

*Results: PPM value (in original sample) or I - interference; NC - not computed; NG - sample value below blank; ND - not detectable (<2σ blank or baseline).

ACUREX Corporation
ANALYSIS LABORATORIES

DATA REPORTING FORM

CUSTOMER CMEA

DATE July 10, 1980

CUSTOMER CONTRACT NO. 307605.22

ACUREX CONTRACT NO.

RESULTS REPORT TO

TELEPHONE

ADDRESS
Beloit Test 1 DIESEL BASELINE

SAMPLE ID (CUSTOMER)	Fuel Hg	Lube Hg	Filter Hg	XAD Hg	1 Imp Hg	2 & 3 Hg	2&3 As	2&3 Sb		
SAMPLE ID (LAB)										
PARAMETER										UNITS
Blank	Less 1	Less 1	Less 1	Less 1	Less 1	Less 1	Less 10	Less 3		ug/L
Sample Aliquot	Less 1	Less 1	Less 1	Less 1	Less 1	Less 1	Less 10	Less 3		ug/L
Total Sample					Less 1	Less 1	Less 10	Less 3		ug/L
Total Sample	Less 0.1	Less 0.1	Less 2	Less 0.1						ug/g
Total Sample			Less 1	Less 10	Less 0.9	Less 1	Less 10	Less 3		ug

ANALYST

REVIEWER

Form EED-057 4 80

ACUREX Corporation
ANALYSIS LABORATORIES

DATA REPORTING FORM

CUSTOMER CMEA
DATE July 10, 1980
CUSTOMER CONTRACT NO. 307605.22
ACUREX CONTRACT NO.
RESULTS REPORT TO
TELEPHONE
ADDRESS
Beloit Test 2 DIESEL CONTROLLED NOx

SAMPLE ID (CUSTOMER)	Fuel Hg	Lube Hg	Filter Hg	XAD Hg	1 Imp Hg	2&3 Hg	2&3 As	2&3 Sb		
SAMPLE ID (LAB)										
PARAMETER										UNITS
Blank	Less 1	Less 1	Less 1	Less 1	Less 1	Less 1	Less 10	Less 3		ug/L
Sample Aliquot	Less 1	Less 1	Less 1	Less 1	Less 1	Less 1	Less 10	Less 3		ug/L
Total Sample					Less 1	Less 1	Less 10	Less 3		ug/L
Total Sample	Less 0.1	Less 0.1	Less 2	Less 0.1						ug/g
Total Sample			Less 2	Less 10	Less 1	Less 1	Less 10	Less 3		ug

ANALYST

REVIEWER

5.5 TCO, GRAV, AND GC/MS RESULTS AND INFRARED SPECTRA OF TOTAL SAMPLE EXTRACTS

ACUREX
Corporation
ANALYSIS LABORATORIES

DATA REPORTING FORM

CUSTOMER CMEA
DATE July 15, 1980
CUSTOMER CONTRACT NO. 307605.22
ACUREX CONTRACT NO.
RESULTS REPORT TO
TELEPHONE
ADDRESS
Beloit Test 1 Diesel Baseline

SAMPLE ID (CUSTOMER)	Filter	XAD	DMC							
SAMPLE ID (LAB)										
PARAMETER										UNITS
TCO Blank		0.07	Less 0.02							mg
TCO Sample		24	0.26							mg
TCO Sample, Corrected		24	0.26							mg
Grav Blank	Less 2	4	Less 2							mg
GRAV Sample	11	69	Less 2							mg
GRAV, Corrected	11	65	Less 2							mg
TCO & GRAV	11	89	Less 2							mg
TCO & GRAV	0.67	5.4	Less 0.1							mg/dscm

ANALYST M. Gardner, G. Nicoll

REVIEWER

Form EED 05[illegible] 4.80

ACUREX Corporation
ANALYSIS LABORATORIES

DATA REPORTING FORM

CUSTOMER CMEA
DATE July 15, 1980
CUSTOMER CONTRACT NO. 307605.22
ACUREX CONTRACT NO.
RESULTS REPORT TO
TELEPHONE
ADDRESS
Beloit Test 2 Diesel - Low NOx

SAMPLE ID (CUSTOMER)	Filter	XAD	OMC							
SAMPLE ID (LAB)										UNITS
PARAMETER										
TCO Blank		0.07	Less 0.02							mg
TCO Sample		31	0.56							mg
TCO, Corrected		31	0.56							mg
GRAV Blank	Less 2	4	Less 2							mg
GRAV Sample	226	102	Less 2							mg
GRAV, Corrected	226	98	Less 2							mg
TCO & GRAV	226	129	Less 2							mg
TCO & GRAV	10.1	5.8	Less 0.1							mg/dscm

ANALYST M. Gardner, G. Nicoll
REVIEWER

Form EED 057 4 80

COMPOUNDS SOUGHT
Detection Limit in nanograms

8	* 4-bromophenyl phenyl ether
1	* bis (2-chloroisopropyl) ether
2	* bis (2-chloroethoxy) methane
8	* hexachlorobutadiene
40	* hexachlorocyclopentadiene
1	* isophorone
1	* naphthalene
8	* nitrobenzene
4	* N-nitrosodiphenylamine
40	* N-nitrosodi-n-propylamine
3	* bis (2-ethylhexyl) phthalate
3	* butyl benzyl phthalate
1	* di-n-butyl phthalate
2	* di-n-octyl phthalate
2	* diethyl phthalate
2	* dimethyl phthalate
5	* benzo(a)anthracene
7	* benzo(a)pyrene
8	* 3,4-benzofluoranthene
8	* benzo(k)fluoranthene
5	* chrysene
1	* acenaphthylene
1	* anthracene
40	* benzo(ghi)perylene
2	* fluorene
1	* phenanthrene
40	* dibenzo(a,h)anthracene

40	* indeno(1,2,3-cd)pyrene
2	* pyrene
2	* acenaphthene
100	* benzidine
8	* 1,2,4-trichlorobenzene
8	* hexachlorobenzene
8	* hexachloroethane
3	* bis(2-chloroethyl)ether
2	* 2-chloronaphthalene
4	* 1,2-dichlorobenzene
8	* 1,3-dichlorobenzene
4	* 1,4-dichlorobenzene
20	* 3,3-dichlorobenzindine
10	* 2,4-dinitrotoluene
10	* 2,6-dinitrotoluene
1	* 1,2-diphenylhydrazine (as azobenzene)
2	* fluoranthene
4	* 4-chlorophenyl phenyl ether
40	anthanthrene
40	benzo(e)pyrene
@	dibenzo(a,H)pyrene
@	dibenzo(a,i)pyrene
40	dibenzo(c,g)carbozole
40	7,12 dimethyl benz(a)anthracene
40	3-methyl cholanthrene
40	perylene
40	Benzo(c)phenanthrene

*Authenic standard ran

@Molecular weight too high for direct analysis by Base/Neutral run

ACUREX Corporation
ANALYSIS LABORATORIES

DATA REPORTING FORM

CUSTOMER CMEA

DATE July 21, 1980

CUSTOMER CONTRACT NO. 307605.22

ACUREX CONTRACT NO.

RESULTS REPORT TO

TELEPHONE

ADDRESS

Beloit Test 1 16.4 dscm Diesel Baseline

SAMPLE ID (CUSTOMER)	Filter Bk	Filter	XAD Blk	XAD	OMC					
SAMPLE ID (LAB)										
PARAMETER										UNITS
Amount injected	2	1	2	1	2					uL
Bis eth/hex phthalate*	Less 2	390	13	1700	61					mg/L
Fluoranthene*	Less 1	Less 2	Less 1	36	12					mg/L
Naphthalene*	Less 0.5	22	Less 0.5	100	Less 0.5					mg/L
Phenan/Anthracene*	Less 0.5	Less 1	Less 0.5	16	0.8					mg/L
Pyrene*	Less 1	Less 2	Less 1	10	4					mg/L
Bis eth/hex phthalate		32		1100	4.1					ug/dscm
Fluoranthene		Less 0.2		24	0.81					ug/dscm
Naphthalene		1.8		67	Less 0.03					ug/dscm
Phenanthr/Anthracene		Less 0.08		11	0.05					ug/dscm
Pyrene		Less 0.2		7	0.3					ug/dscm

*Sample Aliquot

ANALYST

REVIEWER Greg Nicoll

Form EED 057 4 80

ACUREX Corporation
ANALYSIS LABORATORIES

DATA REPORTING FORM

CUSTOMER CMEA
DATE July 21, 1980
CUSTOMER CONTRACT NO. 307605.22
ACUREX CONTRACT NO.
RESULTS REPORT TO
TELEPHONE
ADDRESS
Beloit Test 2 22.3 dscm Diesel - Low-NO_x

SAMPLE ID (CUSTOMER)	Filter Bk	Filter	XAD Blank	XAD	OMC						
SAMPLE ID (LAB)											
PARAMETER											UNITS
Amount injected	2	1	2	1	2						uL
Bis eth/hex phthalate*	Less 2	170	13	1100	420						mg/L
Fluoranthene*	Less 1	Less 2	Less 1	Less 2	Less 1						mg/L
Naphthalene*	Less 0.5	Less 1	Less 0.5	100	Less 0.5						mg/L
Phenanthr/Anthracene*	Less 0.5	Less 1	Less 0.5	8	1						mg/L
Pyrene*	Less 1	Less 2	Less 1	Less 2	Less 1						mg/L
Bis eth/hex phthalate		83		540	21						ug/dscm
Fluoranthene		Less 1		Less 1	Less 0.05						ug/dscm
Naphthalene		Less 0.5		49	Less 0.02						ug/dscm
Phenanthr/Anthracene		Less 0.5		4	0.05						ug/dscm
Pyrene		Less 1		Less 1	Less 0.05						ug/dscm

*Sample Aliquot

ANALYST
REVIEWER

Form EED 051 4-80

IR REPORT

SAMPLE: Filter Blank

Wave Number (cm^{-1})	Intensity	Assignment	Comments
2905	S	C-H Alkane	
2845	S	C-H Alkane	
2750 - 2450	W	O-H (COOH)	

GN 7/20/80

IR REPORT

SAMPLE: Filter Beloit Test 1

Wave Number (cm^{-1})	Intensity	Assignment	Comments
2905	S	C-H Alkane	
2845	S	C-H Alkane	

IR REPORT

SAMPLE: Filter Beloit Test 2

Wave Number (cm^{-1})	Intensity	Assignment	Comments
2905	S	C-H Alkane	
2845	S	C-H Alkane	
1725	W	C=O	
1445	W	C-H Alkane	
1375	W	C-H Alkane	
725	W	Not Assigned	

IR REPORT

SAMPLE: XAD Blank

Wave Number (cm^{-1})	Intensity	Assignment	Comments
2905	S	C-H Alkane	
2845	S	C-H Alkane	
2750 - 2450	W	O-H (COOH)	

GN / 7/20/90

IR REPORT

SAMPLE: XAD Beloit Test 1

Wave Number (cm⁻¹)	Intensity	Assignment	Comments
3575-3070	W	O-H (COOH)	
2905	S	C-H Alkane	
2845	S	C-H Alkane	
2750-2450	W	O-H (COOH)	
1725	S	C=O (COOH)	
1445	W	C-H Alkane	
1265	W	C-O (COOH)	
1095	W	C-O (COOH)	
805	W	Not Assigned	

IR REPORT

SAMPLE: XAD Beloit Test 2

Wave Number (cm^{-1})	Intensity	Assignment	Comments
3575-3070	W	O-H (COOH)	
2905	S	C-H Alkane	
2845	S	C-H Alkane	
2750-2450	W	O-H (COOH)	
1725	S	C=O (COOH)	
1445	W	C-H Alkane	
1265	W	C-O (COOH)	
805	W	Not Assigned	
705	W	Not Assigned	

IR REPORT

SAMPLE: OMC Beloit Test 2

Wave Number (cm^{-1})	Intensity	Assignment Comments
2905	S	C-H Alkane
2845	S	C-H Alkane

IR REPORT

SAMPLE: OMC Beloit Test 1

Wave Number (cm^{-1})	Intensity	Assignment	Comments
		No Peaks	

5.6 GAS CHROMATOGRAPHY DATA REDUCTION

Hydrocarbon	Baseline				Controlled NO_x					Average percent change from baseline
	Sample 1	Sample 2	Sample 3	Average	Sample 1	Sample 2	Sample 3	Sample 4	Average	
C_1	35.7±3.6	27.3±2.7	7.7±1.5	23.6±2.6	3.5±1.5	6.3±1.5	5.6±1.5	7.0±1.5	5.6±1.5	-76
C_2	18.7±1.9	10.5±1.5	8.2±1.5	12.5±1.6	14.6±1.5	13.7±1.5	14.6±1.5	22.0±2.2	16.2±1.7	+30
C_3	5.7±1.5	1.2±1.6	1.5±1.6	2.8±1.6	2.0±1.6	2.4±1.6	5.4±1.6	4.4±1.6	3.6±1.6	+29
C_4	4.0±1.5	3.3±1.5	6.8±1.5	4.7±1.5	2.2±1.5	1.7±1.5	12.8±1.5	5.0±1.5	5.4±1.5	+15
C_5	4.8±1.6	4.5±1.6	6.1±1.6	5.1±1.6	--[a]	--[a]	9.1±1.6	5.0±1.6	7.0±1.6	+37
C_6	--[a]	--[a]	--[a]	--	--[a]	--[a]	--[a]	--[a]	--	--
Total C_1-C_6	69±10	47±9	30±8	49±9	22±6	24±6	47±8	43±8	38±8	-22[b]

[a] Undetectable

[b] Weighted average percent change in total (C_1-C_6) hydrocarbon emissions

100003

ORGANIC COMPOUNDS (bp < 100° C)

Contractor Colt-Ind. Beloit Wisconsin

Sample Site – **Sample Acquisition Date** N/A **Time**

Type of Source CAL GAS

Test Number Calib. Gas **Sample ID Number** 100003

Sample Description Calibration gas $C_1 - C_6$

Analyst Responsible DaRos **Date Analyzed** 4-23-80 **Time** 1555

Calculations and Report Reviewed By Castaldini **Report Date** 7-9-80

Workup

1. **Column Flow Rate (mL/min)**
2. **Recorder Speed**
3. **Full Scale (mV)** 10 mV
4. **Column Pressure (psi)**
5. **Electrometer Set (A/mV)**
6. **Calibration Date** 4-23-80
7. **Sample Size (mL)** 600 μl
8. **Oven Temperature (°C)**
9. **Flame Flow Rates (mL/min):** H_2 **Air**
10. **Attenuation** X1
11. **Range** X1
12. **Observations**

Column Temp 112°F

Results: PPM value (in original sample) or I – interference; NC – not computed; NG – sample value below blank; ND – not detectable (< 2 σ blank or baseline).

	Uncorrected Sum of Peak Areas	Blank Value	Retention Time	Corrected Sum of Peak Areas	Conc. (%)	Sensitivity	High/Low Calibration Standards	Conc. (ppm)	
IC_1	21.6		1.1					15.1	± 1.5
IC_2	32		1.8					14.6	± 1.5
IC_3	54.9		3.6					15.6	± 1.6
IC_4	69		9.4					15.2	± 1.5
IC_5	84.5		26.7					15.6	± 1.6
IC_6	90		78.0					15.9	± 1.6
IC_7									

100002

ORGANIC COMPOUNDS (bp < 100° C)

Contractor Coit - Beloit, WS.

Sample Site Diesel - Baseline Sample Acquisition Date 4-22-80 Time 1858

Type of Source Compression Ignition Engine

Test Number 1 - Baseline Sample ID Number 100002

Sample Description Stack Gas

Analyst Responsible DraGes Date Analyzed 4-23-80 Time 0841

Calculations and Report Reviewed By Castaldini Report Date

Sample Temp 130°F 1000 μl

Workup

1. Column Flow Rate (mL/min)
2. Recorder Speed 1cm/m
3. Full Scale (mV) 10
4. Column Pressure (psi)
5. Electrometer Set (A/mV)
6. Calibration Date 4-23-80
7. Sample Size (mL) 1.0
8. Oven Temperature (°C)
9. Flame Flow Rates (mL/min): H_2 Air
10. Attenuation X1
11. Range 10'
12. Observations

Air 10psi H_2 18psi H_2 14psi Column Temp 112°F

Results: PPM value (in original sample) or I – interference; NC – not computed; NG – sample value below blank; ND – not detectable (< 2 σ blank or baseline).

	Uncorrected Sum of Peak Areas	Blank Value	Retention Time	Corrected Sum of Peak Areas	Conc. (%)	Sensitivity	High/Low Calibration Standards	Conc. (ppm)	
IC_1	51.1		1.2 min					35.7	C_1
IC_2	26		1.6 min					11.9	C_2
IC_3	15		1.9 min					6.9	
IC_4	18.9		3.5					5.7	C_3
IC_5	19.2		5.2					4.0	C_4
IC_6	25.9		15.0					4.9	C_5
IC_7									

Note: Had to make electrometer adjustments, therefor calibration may be incorrect. However this chromatogram indicates No C_6 or C_5 Present in sample

100004

ORGANIC COMPOUNDS (bp < 100° C)

Contractor COLT -- BELOIT, WS.

Sample Site DIESEL CONTROLLED Sample Acquisition Date 4-23-80 Time 1720 Ⓐ

Type of Source Compression Ignition Engine

Test Number 2 - Controlled NOx Sample ID Number 100004

Sample Description STACK GAS

Analyst Responsible DaRos Date Analyzed 4-24-80 Time

Calculations and Report Reviewed By Pastaldini Report Date

Gas Sample Temp 180 °F

Workup

1. Column Flow Rate (mL/min)
2. Recorder Speed
3. Full Scale (mV) 1mV
4. Column Pressure (psi)
5. Electrometer Set (A/mV)
6. Calibration Date
7. Sample Size (mL) 1500 µl
8. Oven Temperature (°C)
9. Flame Flow Rates (mL/min): H_2 Air
10. Attenuation X1
11. Range X1
12. Observations

Column Temp 112°F

Results: PPM value (in original sample) or I – interference; NC – not computed; NG – sample value below blank; ND – not detectable (< 2 σ blank or baseline).

	Uncorrected Sum of Peak Areas	Blank Value	Retention Time	Corrected Sum of Peak Areas	Conc. (%)	Sensitivity	High/Low Calibration Standards	Conc. (ppm)	
IC_1	5		1.0					3.5	C_1
IC_2	18		1.6					8.2	C_2
IC_3	14		1.8					6.4	
IC_4	7		3.3					2.0	C_3
IC_5	5		4.1					1.1	C_4
IC_6	5		7.4					1.1	
IC_7									

10000[illegible]5

ORGANIC COMPOUNDS (bp < 100° C)

Contractor COLT - - BELOIT, WS.

Sample Site DIESEL CONTROLLED Sample Acquisition Date 4-23-80 Time 12:29

Type of Source Compression Ignition Engine

Test Number 2 - Controlled NOx Sample ID Number 100005

Sample Description STACK GAS

Analyst Responsible DiaRos Date Analyzed 4-23-80 Time 1248

Calculations and Report Reviewed By Pastildini Report Date

Sample Temp 240°F

Workup

1. Column Flow Rate (mL/min)
2. Recorder Speed
3. Full Scale (mV) 1.0 mV
4. Column Pressure (psi)
5. Electrometer Set (A/mV)
6. Calibration Date
7. Sample Size (mL) 1000 μl
8. Oven Temperature (°C)
9. Flame Flow Rates (mL/min): H_2 Air
10. Attenuation X1
11. Range X1
12. Observations

Results: PPM value (in original sample) or I – interference; NC – not computed; NG – sample value below blank; ND – not detectable (< 2 σ blank or baseline).

	Uncorrected Sum of Peak Areas	Blank Value	Retention Time min	Corrected Sum of Peak Areas	Conc. (%)	Sensitivity	High/Low Calibration Standards	Conc. (ppm)	
C_1	9		1.0					6.3	C_1
C_2	18		1.6					2.2	C_2
C_3	12		1.9 (8)					5.5	
C_4	8		3.3					2.4	C_3
C_5	2		5.1					0.4	C_4
C_6	6		8.4					1.3	
C_7									

100006

ORGANIC COMPOUNDS (bp < 100° C)

Contractor Colt Ind. Beloit Wisconsin

Sample Site DIESEL BASELINE Sample Acquisition Date 4-22-80 Time 1858

Type of Source Compression Ignition Engine

Test Number 1 Baseline Sample ID Number 100006

Sample Description STACK GAS

Analyst Responsible DaRos Date Analyzed 4-23-80 Time 1219

Calculations and Report Reviewed By Pastaldini Report Date

Sample Temp 280°F

Workup

1. Column Flow Rate (mL/min)
2. Recorder Speed 1 cm/m
3. Full Scale (mV) 1 mV
4. Column Pressure (psi)
5. Electrometer Set (A/mV)
6. Calibration Date
7. Sample Size (mL) 1.0
8. Oven Temperature (°C)
9. Flame Flow Rates (mL/min): H_2 Air
10. Attenuation X1
11. Range 10'
12. Observations

Results: PPM value (in original sample) or I – interference; NC – not computed; NG – sample value below blank; ND – not detectable (< 2 σ blank or baseline).

	Uncorrected Sum of Peak Areas	Blank Value	Retention Time	Corrected Sum of Peak Areas	Conc. (%)	Sensitivity	High/Low Calibration Standards	Conc. (ppm)	
IC_1	39		1.0					27.3	C_1
IC_2	12		1.4					5.5	C_2
IC_3	11		1.8					5.0	
IC_4	4		3.5					1.2	C_3
IC_5	4		5.1					0.9	C_4
IC_6	11		8.3					2.4	
IC_7	16		14.8					3.0	C_5
	8		19.0					1.5	

T00007

ORGANIC COMPOUNDS (bp < 100° C)

Contractor Cart -- Gelvit, WS

Sample Site Diesel Baseline Sample Acquisition Date 4-22-80 Time 1641

Type of Source Compression Ignition Engine

Test Number 1 Baseline Sample ID Number 100007

Sample Description STACK GAS

Analyst Responsible DrRes Date Analyzed ____ Time ____

Calculations and Report Reviewed By ____ Report Date ____

Sample Temp 300°F 1000μl

Workup

1. Column Flow Rate (mL/min) ____
2. Recorder Speed 1cm/m
3. Full Scale (mV) 10mv
4. Column Pressure (psi) ____
5. Electrometer Set (A/mV) ____
6. Calibration Date ____
7. Sample Size (mL) 10
8. Oven Temperature (°C) ____
9. Flame Flow Rates (mL/min): N_2 ____ Air ____
10. Attenuation X1
11. Range 10'
12. Observations ____

Results: PPM value (in original sample) or I – interference; NC – not computed; NG – sample value below blank; ND – not detectable (< 2 σ blank or baseline).

	Uncorrected Sum of Peak Areas	Blank Value	Retention Time	Corrected Sum of Peak Areas	Conc. (%)	Sensitivity	High/Low Calibration Standards	Conc. (ppm)	
IC_1	11		1.0					7.7	C_1
IC_2	6		1.4					2.7	C_2
IC_3	12		1.8					5.5	
IC_4	5		3.5					1.5	C_3
IC_5	24		5.1					5.3	C_4
IC_6	7		8.4					1.5	
IC_7	6		13.6					11	C_5
	27		15.3					5.0	

100008

ORGANIC COMPOUNDS (bp < 100° C)

Contractor COLT IND. Beloit Wisconsin

Sample Site DIESEL CONTROLLED Sample Acquisition Date 4-23-80 Time 1229

Type of Source Compression ignition engine

Test Number 2 Controlled NOx Sample ID Number 100008

Sample Description STACK GAS

Analyst Responsible DaRos Date Analyzed 4-23-80 Time ~~4-23-80~~ 2:44P

Calculations and Report Reviewed By Castaldini Report Date

Sample Temp 330°F

Workup

1. Column Flow Rate (mL/min)
2. Recorder Speed
3. Full Scale (mV)
4. Column Pressure (psi)
5. Electrometer Set (A/mV)
6. Calibration Date
7. Sample Size (mL) 1000 µl
8. Oven Temperature (°C)
9. Flame Flow Rates (mL/min): H_2 Air
10. Attenuation X1
11. Range X1
12. Observations

Results: PPM value (in original sample) or I – interference; NC – not computed; NG – sample value below blank; ND – not detectable (< 2 σ blank or baseline).

	Uncorrected Sum of Peak Areas	Blank Value	Retention Time	Corrected Sum of Peak Areas	Conc. (%)	Sensitivity	High/Low Calibration Standards	Conc. (ppm)	
C_1	8		1.0					5.6	C_1
C_2	19		1.5					8.7	C_2
C_3	13		1.8					5.9	
C_4	18		3.3					5.4	C_3
C_5	38		5.0					8.4	C_4
C_6	20		8.2					4.4	
C_7	7		12.9					1.3	C_5
	42		14.5					7.5	

100009

ORGANIC COMPOUNDS (bp < 100° C)

Contractor CORT -- BELOIT, WS

Sample Site DIESEL CONTROLLED Sample Acquisition Date 4-23-80 Time 1720B

Type of Source Compression Ignition Engine

Test Number 2- Controlled NOx Sample ID Number 100009

Sample Description STACK GAS

Analyst Responsible DmRos Date Analyzed ______ Time ______

Calculations and Report Reviewed By Costaldi... Report Date ______

Gas Temp 180°F

Workup

1. Column Flow Rate (mL/min) ______ 2. Recorder Speed ______

3. Full Scale (mV) 1.0mV 4. Column Pressure (psi) ______

5. Electrometer Set (A/mV) ______ 6. Calibration Date ______

7. Sample Size (mL) 1000µl 8. Oven Temperature (°C) ______

9. Flame Flow Rates (mL/min): H_2 ______ Air ______

10. Attenuation ______ 11. Range ______

12. Observations ______

Results: PPM value (in original sample) or I – interference; NC – not computed; NG – sample value below blank; ND – not detectable (< 2 σ blank or baseline).

	Uncorrected Sum of Peak Areas	Blank Valve	Retention Time	Corrected Sum of Peak Areas	Conc. (%)	Sensitivity	High/Low Calibration Standards	Conc. (ppm)	
iC_1	11 / 9		1.0 / 1.0					7.7/6.3	C_1
iC_2	24 / 28		1.5 / 1.5					11.0/12.8	C_2
iC_3	22 / 23		1.8 / 1.9					10.0/10.5	
iC_4	13 / 16		3.3 / 3.4					3.7/4.2	C_3
iC_5	12 / 10		5.1 / 5.3					2.0/2.2	C_4
iC_6	8 / 15		8.5 / 9.9					1.8/3.3	
iC_7	3 / 17		13.4 / 14.4					0.6/3.1	C_5
	12 / 22		15.2 / 16.3					2.2/4.1	

initial report

5.7 LC FRACTIONATION OF SELECTED EXTRACT SAMPLES WITH TCO, GRAV, AND IR RESULTS ON LC FRACTIONS

SAMPLE: Beloit 1 XAD #1533

	TCO mg	GRAV mg	TCO + GRAV Total mg	Concentration mg/dscm
Total Sample[1]	24	65	89	5.4
Taken for LC[2]	12	31	43	2.6
Recovered[3]	9.5	24	34	2.1

Fraction	TCO in mg				GRAV in mg				TCO + GRAV Total mg	Concentration mg/dscm
	Found in Fraction	Blank	Corrected	Total[4]	Found in Fraction	Blank	Corrected	Total[4]		
1	9.1	<0.02	9.1	19	12	<1	12	25	44	2.7
2	0.14	<0.01	0.14	0.29	<0.8	<0.8	0.8	<2	<2	<0.1
3	0.06	<0.01	0.06	0.1	1.8	<0.8	1.8	4	4	0.2
4	0.08	<0.01	0.08	0.2	2.6	1.2	1.4	3	3	0.2
5	0.03	<0.01	0.03	0.06	1.6	<0.8	1.6	3	3	0.2
6	0.06	<0.01	0.06	0.1	4.8	<0.8	4.8	10	10	0.6
7	<0.01	<0.01	<0.01	<0.02	2.2	<0.8	2.2	5	5	0.3
Sum	9.5	<0.08	9.5	20	25	<6	24	50	70	4.3

1. Quantity in entire sample, determined before LC
2. Portion of whole sample used for LC, actual mg
3. Quantity recovered from LC column, actual mg
4. Total mg computed back to total sample

IR REPORT

SAMPLE: Beloit XAD Blank 1535 F1

Wave Number (cm^{-1})	Intensity	Assignment	Comments
		No Peaks	

IR REPORT

SAMPLE: Beloit XAD Blank 1535 F2

Wave Number (cm^{-1})	Intensity	Assignment	Comments
		No Peaks	

IR REPORT

SAMPLE: Beloit XAD Blank 1535 F3

Wave Number (cm⁻¹)	Intensity	Assignment	Comments
		No Peaks	

IR REPORT

SAMPLE: Beloit XAD Blank 1535 F4

Wave Number (cm^{-1})	Intensity	Assignment	Comments
		No Peaks	

IR REPORT

SAMPLE: Beloit XAD Blank 1535 F5

Wave Number (cm^{-1})	Intensity	Assignment	Comments
		No Peaks	

IR REPORT

SAMPLE: Beloit XAD Blank 1535 F6

Wave Number (cm⁻¹)	Intensity	Assignment	Comments
		No Peaks	

IR REPORT

SAMPLE: Beloit XAD Blank   1535 F7

Wave Number (cm^{-1})	Intensity	Assignment	Comments
		No Peaks	

IR REPORT

SAMPLE: Beloit 1 XAD 1533 F1

Wave Number (cm^{-1})	Intensity	Assignment	Comments
		No Peaks	

IR REPORT

SAMPLE: Beloit 1 XAD 1533 F2

Wave Number (cm^{-1})	Intensity	Assignment	Comments
		No Peaks	

IR REPORT

SAMPLE: Belcit 1 XAD 1533 F3

Wave Number (cm^{-1})	Intensity	Assignment	Comments
		No Peaks	

IR REPORT

SAMPLE: Beloit 1 XAD 1533 F4

Wave Number (cm^{-1})	Intensity	Assignment	Comments
		No Peaks	

IR REPORT

SAMPLE: Beloit 1 XAD 1533 F5

Wave Number (cm⁻¹)	**Intensity**	**Assignment Comments**
		No Peaks

IR REPORT

SAMPLE: Beloit 1 XAD 1533 F6

Wave Number (cm^{-1})	Intensity	Assignment Comments
		No Peaks

IR REPORT

SAMPLE: Beloit 1 XAD 1533 F7

Wave Number (cm^{-1})	Intensity	Assignment	Comments
		No Peaks	

SAMPLE: Beloit 2 XAD #1534

	TCO mg	GRAV mg	TCO + GRAV Total mg	Concentration mg/dscm
Total Sample[1]	31	100	130	5.8
Taken for LC[2]	12	38	50	2.2
Recovered[3]	15	43	58	2.6

Fraction	TCO in mg				GRAV in mg				TCO + GRAV Total mg	Concentration mg/dscm
	Found in Fraction	Blank	Corrected	Total[4]	Found in Fraction	Blank	Corrected	Total[4]		
1	14	<0.02	14	37	22	<1	22	58	95	4.3
2	0.25	<0.01	0.25	0.66	1.4	<0.8	1.4	4	5	0.2
3	0.22	<0.01	0.22	0.58	2.6	<0.8	2.6	7	8	0.4
4	0.06	<0.01	0.06	0.2	8.0	1.2	6.8	18	18	0.8
5	0.05	<0.01	0.05	0.1	2.2	<0.8	2.2	6	6	0.3
6	0.09	<0.01	0.09	0.2	4.6	<0.8	4.6	12	12	0.5
7	<0.01	<0.01	<0.01	<0.02	3.0	<0.8	3.0	8	8	0.4
Sum	15	<0.08	15	39	44	<6	43	110	150	6.9

1. Quantity in entire sample, determined before LC
2. Portion of whole sample used for LC, actual mg
3. Quantity recovered from LC column, actual mg
4. Total mg computed back to total sample

IR REPORT

SAMPLE: Beloit 2 XAD 1534 F1

Wave Number (cm^{-1})	Intensity	Assignment	Comments
2920	s	CH Aliphatic hydrocarbons	
2840	s	CH Aliphatic hydrocarbons	
1450	w	CH Aliphatic hydrocarbons	
1270	w	CO Aliphatic hydrocarbons	

IR REPORT

SAMPLE: Beloit 2 XAD 1534 F2

Wave Number (cm^{-1})	Intensity	Assignment	Comments
		No Peaks	

IR REPORT

SAMPLE: Beloit 2 XAD 1534 F3

Wave Number (cm^{-1})	Intensity	Assignment	Comments
		No Peaks	

IR REPORT

SAMPLE: Beloit 2 XAD 1534 F4

Wave Number (cm⁻¹)	Intensity	Assignment	Comments
		No Peaks	

IR REPORT

SAMPLE: Beloit 2 XAD 1534 F5

Wave Number (cm^{-1})	Intensity	Assignment	Comments
3620-3140	s	OH Alcohol, Acid	

IR REPORT

SAMPLE: Beloit 2 XAD 1534 F6

Wave Number (cm^{-1})	Intensity	Assignment Comments
		No Peaks

IR REPORT

SAMPLE: Beloit 2 XAD 1534 F7

Wave Number (cm⁻¹)	Intensity	Assignment	Comments
		No Peaks	

SAMPLE: Beloit 2 Front Half #1513

	TCO mg	GRAV mg	TCO + GRAV Total mg	Concentration mg/dscm
Total Sample[1]	NA	226	226	10.1
Taken for LC[2]	-	86	86	3.9
Recovered[3]	-	81	81	3.6

Fraction	TCO in mg				GRAV in mg				TCO + GRAV Total mg	Concentration mg/dscm
	Found in Fraction	Blank	Corrected	Total[4]	Found in Fraction	Blank	Corrected	Total[4]		
1					74	<1	74	190	190	8.5
2					1.6	<0.8	1.6	4	4	0.2
3					3.2	<0.8	3.2	8	8	0.4
4					2.2	<0.8	2.2	6	6	0.3
5					< 0.8	<0.8	<0.8	< 2	<2	< 0.09
6					5.2	<0.8	5.2	14	14	0.6
7					2.6	<0.8	2.6	7	7	0.3
Sum					89	<6	89	130	230	10

1. Quantity in entire sample, determined before LC
2. Portion of whole sample used for LC, actual mg
3. Quantity recovered from LC column, actual mg
4. Total mg computed back to total sample

IR REPORT

SAMPLE: Beloit Filter Blank 1521 F1

Wave Number (cm^{-1})	Intensity	Assignment Comments
		No Peaks

IR REPORT

SAMPLE: Beloit Filter Blank 1521 F2

Wave Number (cm^{-1})	Intensity	Assignment Comments
		No Peaks

IR REPORT

SAMPLE: Beloit Filter Blank 1521 F3

Wave Number (cm^{-1})	Intensity	Assignment Comments
		No Peaks

IR REPORT

SAMPLE: Beloit Filter Blank 1521 F3

Wave Number (cm^{-1})	Intensity	Assignment	Comments
		No Peaks	

IR REPORT

SAMPLE: Beloit Filter Blank 1521 F4

Wave Number (cm⁻¹)	Intensity	Assignment	Comments
		No Peaks	

IR REPORT

SAMPLE: Beloit Filter Blank 1521 F5

Wave Number (cm^{-1})	Intensity	Assignment	Comments
		No Peaks	

IR REPORT

SAMPLE: Beloit Filter Blank 1521 F6

Wave Number (cm^{-1})	Intensity	Assignment Comments
		No Peaks

IR REPORT

SAMPLE: Beloit Filter Blank 1521 F7

Wave Number (cm⁻¹)	Intensity	Assignment Comments
		No Peaks

IR REPORT

SAMPLE: Beloit 2 Front Half 1513 Fl

Wave Number (cm^{-1})	Intensity	Assignment	Comments
2920	s	CH Aliphatic hydrocarbons	
2860	s	CH Aliphatic hydrocarbons	
1470	w	CH Aliphatic hydrocarbons	

IR REPORT

SAMPLE: Beloit 2 Front Half 1513 F2

Wave Number (cm^{-1})	Intensity	Assignment Comments
		No Peaks

IR REPORT

SAMPLE: Beloit 2 Front Half 1513 F3

Wave Number (cm^{-1})	Intensity	Assignment Comments
2920	s	CH Heterocyclic oxygen compounds
2840	s	CH Heterocyclic oxygen compounds

IR REPORT

SAMPLE: Beloit 2 Front Half 1513 F4

Wave Number (cm⁻¹)	Intensity	Assignment	Comments
		No Peaks	

IR REPORT

SAMPLE: Beloit 2 Front Half 1513 F5

Wave Number (cm^{-1})	Intensity	Assignment	Comments
3520-3420	s	NH Amine, OR ALCOHOL	

IR REPORT

SAMPLE: Beloit 2 Front Half 1513 F6

Wave Number (cm^{-1})	Intensity	Assignment	Comments
2920	s	CH ~~Carboxylic acids~~ Aliphatic	

IR REPORT

SAMPLE: Beloit 2 Front Half 1513 F7

Wave Number (cm^{-1})	Intensity	Assignment	Comments
2920	s	CH Carboxylic acids	

5.8 LRMS ANALYSES OF SELECTED LC FRACTIONS AND TOTAL SAMPLE EXTRACTS

ACUREX Corporation

Energy & Environmental Division

CMEA/ACUREX

October 8, 1981
Acurex ID#: A81-08-022
Client P.O. #: 307605

Samples: 45 extracts from previous work

The above reference samples were analyzed by direct probe mass spectrometry. Searches have been made for classes of compounds most likely to be found in the various LC fractions, according to procedures described in the "IERL-RTP Procedures Manual: Level 1 Environmental Assessment". The following fragment ions used for search are given below:

Compound Class	Fragment ions (m/e^-)
Aliphatic hydrocarbons	57,71,85
Halogenated aliphatics	63,65
Polycyclic aromatics	178,202,228,252
Halogenated ethers	63,65,73
Alcohols	75,89,103
Phenols	51,77,94
Halogenated phenols	162,196
Nitrophenols	139
Phthalate esters	149,167
Amines	84,98
Nitrosamines	44,58
N-heterocyclics	167,193
Mercaptans	47,61
Sulfides	75,89,103
Benzothiophenes	134
Carboxylic acids	60,73
Carboxylic acids esters	74,87

The various classes of compounds identified in each fraction are given on the attached data sheets. Classes of compounds identified include phenols, carboxylic acids, mercaptans, and esters (include phthalates). There was a background of aliphatic hydrocarbons throughout the analyses.

To test the analysis procedure, a standard mixture containing ethers, amines, polycyclic aromatic hydrocarbons, nitrosamines, phenols, etc., was analysed under identical conditions as the samples. Losses of the very volatile compounds such as naphthalene, bis-chloro ethyl ether, low molecular weight nitrosamines were observed, however the higher molecular weight compounds in a particular class were recovered.

Prepared by: Greg Nicoll
Greg Nicoll
Program Director

Approved by: Viorica Lopez Avila
Viorica Lopez-Avila, Ph.D.
Technical Director

GN/VLA:es

LRMS REPORT

SAMPLE: 1507 Beloit 1 Front half

Major Categories

Intensity	Category	MW Range
1	Aliphatic hydrocarbons	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition

Other

LRMS REPORT

SAMPLE: 1513 F1 Beloit 2 Front half

Major Categories

Intensity	Category	MW Range
1	Aliphatic hydrocarbons	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition

Other

LRMS REPORT

SAMPLE: 1513 F2+3 Beloit 2 Front half

Major Categories

Intensity	Category	MW Range
	None found	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition

Other

LRMS REPORT

SAMPLE: 1513 F4+5 Beloit 2 Front half

Major Categories

Intensity	Category	MW Range
	None found	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition

Other

LRMS REPORT

SAMPLE: 1513 F6+7 Beloit 2 Front half

Major Categories

Intensity	Category	MW Range
10	Phenols	
10	Mercaptans	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition

Other

LRMS REPORT

SAMPLE: 1533 Fl Beloit 1 XAD

Major Categories

Intensity	Category	MW Range
1	Aliphatic hydrocarbons ✓	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition

Other

LRMS REPORT

SAMPLE: 1533 F2+3 Beloit 1 XAD

Major Categories

Intensity	Category	MW Range
	None found	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition

Other

LRMS REPORT

SAMPLE: 1533 F4+5 Beloit 1 XAD

Major Categories

Intensity	Category	MW Range
10	Esters	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition

Other

LRMS REPORT

SAMPLE: 1533 F6+7 Beloit 1 XAD

Major Categories

Intensity	Category	MW Range
10	Phenols	
10	Carboxylic acids	
10	Mercaptans	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition

Other

LRMS REPORT

SAMPLE: 1534 F1 Beloit 2 XAD

Major Categories

Intensity	Category	MW Range
1	Aliphatic hydrocarbons	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition

Other

LRMS REPORT

SAMPLE: 1534 F2+3 Beloit 2 XAD

Major Categories

Intensity	Category	MW Range
	None found	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition

Other

LRMS REPORT

SAMPLE: 1534 F4+5 Beloit 2 XAD

Major Categories

Intensity	Category	MW Range
10	Esters	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition

Other

LRMS REPORT

SAMPLE: 1534 F6+7 Beloit 2 XAD

Major Categories

Intensity	Category	MW Range
10	Phenols	
10	Mercaptans	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition

Other

Acorn Park
Cambridge, Massachusetts 02140
617 864-5770 Telex 921436

Arthur D. Little, Inc.

July 8, 1982

Dr. Larry Waterland
M2S-2260
Accurex Corporation
485 Clyde Avenue
Mountain View, CA 94042

Dear Larry: 1-7641

We have completed the batch inlet LRMS analysis of your ten Level 1 samples. The data obtained in the analysis of these samples is reported on the enclosed, standard EPA Level 1 LRMS report forms. The intensity levels are reported for this (batch) analysis only, as though it were the complete LRMS analysis. Presumably you will integrate the data from these analyses with your own direct probe LRMS analysis of the same samples.

We have reported the "sample" content of the samples as though the solvent(s) were not present; a component reported as intensity 100 is a major component of the non-solvent portion of the spectrum; one as intensity 10 when it is present and identifiable in the non-solvent portion of the spectrum, and so on. Intensity level 1 components appeared to be present in some of the samples, but were not specifically identifiable. When they occur they are included in the unclassified category.

All samples were analyzed by direct injection of 4 µL of sample into the three liter glass inlet of the mass spectrometer. The mass spectrometer was operated in the electron impact ionization mode, at 70 eV. Low energy ionization was not used due to the low level of sample material as compared to the solvent content of the sample. Instrument blanks were obtained by direct injection of 4 µL of spectra grade methylene chloride. One sample (AC009) was

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Madrid São Paulo Wiesbaden

concentrated 3X and given an additional direct injection analysis. This was done only to clarify some spectral ambiguities. The reported data is from the unconcentrated initial analysis.

If you have any questions about any of this work, please feel free to call me.

Yours Truly,

James L. Stauffer

/laf

enclosures

LRMS REPORT

SAMPLE: Beloit 1 XAD 1533 LC1 (AC001)

Major Categories

Intensity	Category	MW Range
100	Aromatic Hydrocarbons	. –
100	Fused alternate/nonalternate hydrocarbons	< 216
100	Aliphatic Hydrocarbons	–
100	Unclassified	94, 98

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition
100	Naphthalene + alkyls	128–170	$C_{10}H_8$ - $C_{13}H_{14}$

Other

LRMS REPORT

SAMPLE: Beloit 2 XAD 1534 LC1 (AC007)

Major Categories

Intensity	Category	MW Range
	Nothing reliably present above the	
	background level.	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition

Other

5.9 BIOASSAY ANALYSIS REPORT

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cc: Bert Higginbotham

Litton BIONETICS
5516 Nicholson Lane Kensington Maryland 20795 301 881-5600 · Telex 89-8369

December 10, 1980

RECEIVED
[illegible]
ACUREX

Mr. Roy Belletto
Acurex Corporation
485 Clyde Avenue
Mountain View, CA 94042

Dear Mr. Belletto:

Enclosed are five copies of the final reports for the compound sample #1452 submitted for evaluation in the Ames/Salmonella and the In Vivo Rodent Quantal Toxicity Assays. All studies were conducted and evaluated under EPA Level 1 guidelines. The final reports have been reviewed by the Litton Bionetics Quality Assurance Unit to ensure compliance with GLP regulations. These final reports supersede the two draft reports sent on December 3, 1980. There are no significant changes between the draft and final versions of the reports.

If you have any questions or comments concerning the reports, please feel free to contact me at (301)881-5600, extension 527. I hope we may be of service to you in the future.

Sincerely,

David J. Brusick

David J. Brusick, Ph.D.
Director
Department of Genetics
and Cell Biology

DJB/mg

Enclosures: 5394 - Ames
5394 - Rodent Quantal

BIOASSAY SUMMARY TABLE

Technical Directive or Project No. LBI Project No. 20933

Contract No. Acurex Subcontract RB59178A, Release No. 1

Sample Identification	Health Effects Tests				Ecological Effects Tests									Notes
					Aquatic						Terrestrial			
					Fresh Water			Marine						
	AMES Salmonella*	RAM Cytotoxicity	CHO Cytotoxicity	Rodent Toxicity	Fish	Invertebrate	Algal	Fish	Invertebrate	Algal	Plant Stress Ethylene	Root Elongation	Insect Toxicity	
1533 (CMEA	M		H											
Beloit No. 1														
XAD-2 Extract)														
1534 (CMEA	M		H/M											
Beloit No. 2														
XAD-2 Extract)														

ND = No Detectable Toxicity
L = Low Toxicity
M = Moderate Toxicity
H = High Toxicity

* Evaluation of Ames Salmonella test is based upon mutagenicity and not toxicity.

DEFINITION OF TOXICITY CATEGORIES FOR HEALTH EFFECTS ASSAYS

Assay[a]	Activity Measured[b]	Sample Type[c]	MAD[d]	Units	Range of Concentration or Dosage			
					High	Moderate	Low	Not Detectable (ND)
Ames	MEC (mutagenesis)	S	5	mg/plate	<0.05	0.05-0.5	0.5-5	ND at >5
		AL,NAL	200	µl/plate	<2	2-20	20-200	ND at >200
		E	5000	L/plate	<50	50-500	500-5000	ND at >5000
RAM	EC_{50} (lethality)	S	1	mg/ml	<0.01	0.01-0.1	0.1-1	ND at >1
		AL	600	µl/ml	<6	6-60	60-600	ND at >600
		NAL	20	µl/ml	<0.2	0.2-2	2-20	ND at >20
		E	1000	L/ml	<10	10-100	100-1000	ND at >1000
CHO	EC_{50} (lethality)	S	1	mg/ml	<0.01	0.01-0.1	0.1-1	ND at >1
		AL	600	µl/ml	<6	6-60	60-600	ND at >600
		NAL	20	µl/ml	<0.2	0.2-2	2-20	ND at >20
		E	1000	L/ml	<10	10-100	100-1000	ND at >1000
WAT	LD_{50} (lethality and toxic signs)	S	5	gm/kg	<0.05	0.05-0.5	0.5-5	ND at >5
		AL,NAL	5	ml/kg	<0.05	0.05-0.5	0.5-5	ND at >5

[a] Standard test abbreviations are as follows:
Ames: Ames *Salmonella*/microsome mutagenesis assay
RAM: Rabbit alveolar macrophage cytotoxicity assay
CHO: Rodent cell clonal toxicity assay
WAT: Acute *in vivo* test in rodents (whole animal test)

[b] Standard abbreviations for measured endpoints are as follows:
MEC: Minimum effective concentration
EC_{50}: Calculated concentration expected to produce effect in 50 percent of population
LD_{50}: Calculated dose expected to kill 50 percent of population

[c] S = Solid, AL = Aqueous liquid, NAL = Nonaqueous liquid, E = Extract and/or concentrate of unknown organic content (use equivalent volume of SASS train gas)

[d] MAD = Maximum applicable dose

TABLE

HEALTH EFFECTS CRITICAL DATA SUMMARY FORM[a]

Contract No. Acurex Subcontract RB59178A, Release I Technical Directive or Project No. LBI Project No. 20933 Site Sampled Beloit

			RAM Cytotoxicity [EC50][c]				Rodent Toxicity	
Sample Identification	Ames Mutagenicity [MEC][b]	CHO Clonal Toxicity [EC_{50}][c]	Viability	Viability Index	ATP	ATP/Per 10^6 Cells	LD_{50}[d]	Toxic Signs[e]
1533 (CMEA Beloit No. 1	13.0 µg	4.29 µg/ml						
XAD-2 Extract)								
1534 (CMEA Beloit No. 2	302.5 µg	13.3 µg/ml						
XAD-2 Extract)								

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[a] The assays, observed parameters and evaluation criteria are presented in IERL-RTP Procedures Manual; Level 1 Environmental Assessment Biological Tests, [EPA Contract No. 68-02-2681, Litton Bionetics, Inc., Kensington, Md., September 1980, In press.]

[b] MEC: Minimum Effective Concentration - Lowest concentration for any tester strain giving a mutagenic response.

[c] EC_{50}: Effective concentration that reduces the observed parameter to 50 percent of the appropriate negative control.

[d] LD_{50}: The dose lethal to 50 percent of treated animals.

[e] Toxic signs are identified in a numbered list in the Level 1 manual. Only the number is reported here.

LBI-0798 1/81